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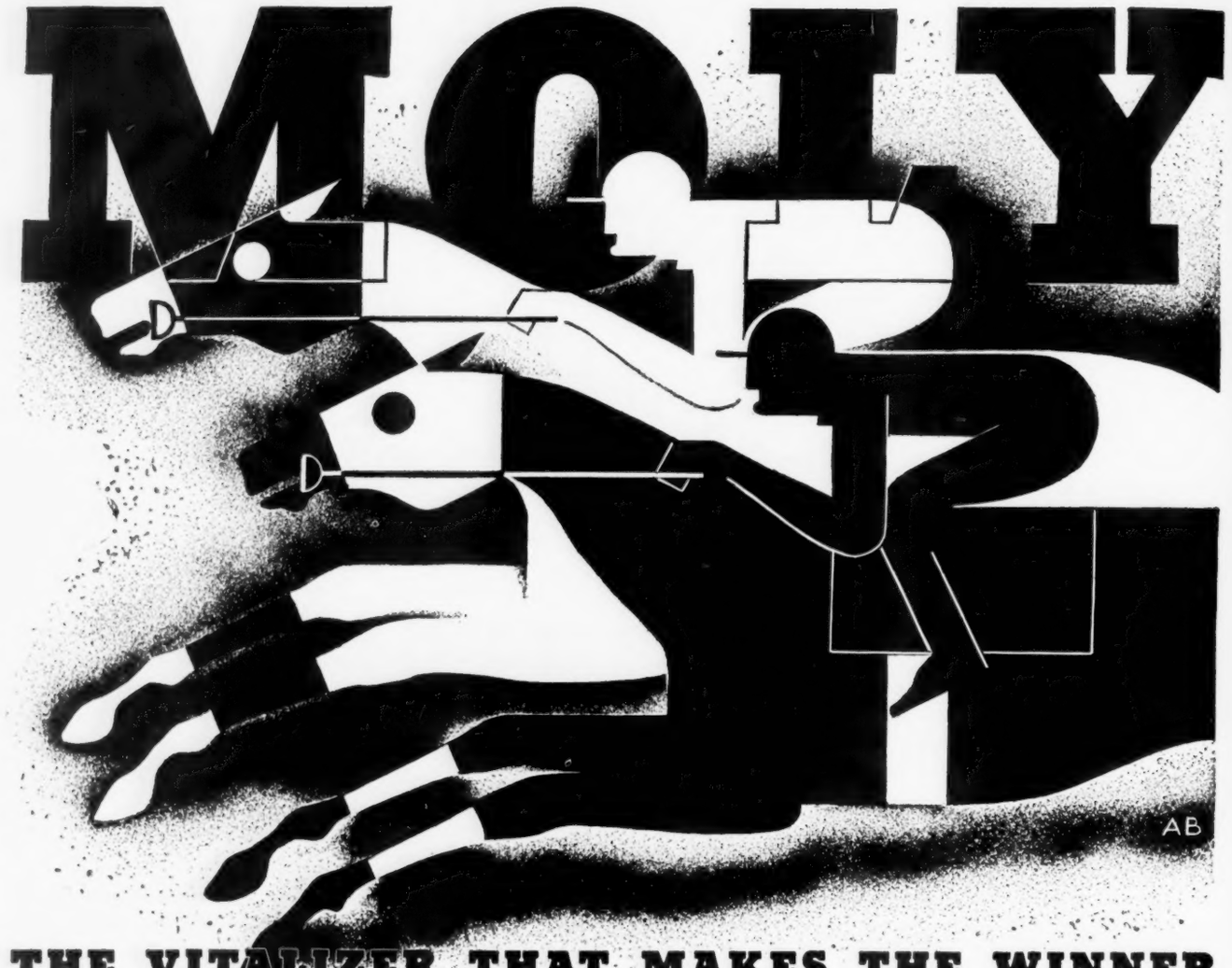


## THE VITALIZER THAT MAKES THE WINNER

It is often the invisible extra spirit or infinitesimal extra energy that makes the priceless difference between "a race horse" and "a *great* race horse." A similar striking distinction exists between ordinary irons and steels and those into which "Moly" has injected the spark of virility that leads to outstanding qualities for strength, wear, machinability, easy heat-treating, and toughness combined with hardness. Moly really "does something to iron and steel"—many things, in truth. Even more amazing is the fact that so little does so much; and that the slight added cost is repaid over and over in product betterments.

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# As the Editor Views the News

SCHEDULING hearings in opposition to the Black 30-hour bill for Feb. 12 probably was accidental, yet no more appropriate date could have been set. The anniversary of the birth of a great American is an auspicious time for citizens to protest against a bill which is unamerican in spirit, fallacious in economic concept and vicious in punitive and vindictive portent. Because it has been said the administration does not favor the proposal, some commentators have predicted it will not pass. This has blinded many industrial executives to the real danger. The threat is serious. Industry should make the fight of its life to defeat the bill decisively.

• • •

Death of the Black bill would be another blow to the prestige of A. F. of L. Mr. Green and his cause lost heavily in public esteem in his wrangle with President Roosevelt and Donald Richberg (p. 16) over the extension of the automobile code. The publicity attending this incident accentuated the poor showing of A. F. of L. in the auto plant voting and prompted public criticism of Mr .Green and his associates for failing to capitalize the opportunities offered by NIRA. As we have intimated before, Mr. Green's mistake is that he strives too much for the power of A. F. of L. and himself and not enough for real benefits for employes.

**Another Blow for A. F. of L**

• • •

Action of the department of justice on Thursday in seeking to block the proposed Republic-Corrigan, McKinney merger and to break up "interlocking directorships" in several steel companies (p. 14) introduced a new note of uncertainty into industrial and financial circles. Does this move represent a studied decision of the government administration to challenge all combinations and all situations in which an individual sits on the boards of two or more competing companies? Does the suit reflect a definite policy of the government or a random shot of a department subordinate who went off half-cocked? Again, is it a sincere effort to guard the public interest, or is it a vindictive move? Until the attorney general explains the motive satisfactorily, industry will be puzzled as to what it can or cannot do under the law.

**What Is U. S. Motive?**

• • •

It may be that the suit was ordered by high administration authority as a sop to Senator Borah and others who consistently oppose modification of the antitrust laws, for the purpose of lulling them into silence while the plans for extending NRA are being formulated. If this or any other far fetched political maneuver was the basis for the action, it will indicate that this administration is as blind as its predecessors to the vital needs of clarifying the antitrust laws. Industry cannot operate efficiently under laws which are ignored one day and enforced the next. Consistent interpretation and uniform enforcement have been lacking from the very beginning—to the unnecessary annoyance and detriment of industry.

**Consistent Policy Needed**

• • •

Another new passenger train of stainless steel construction (p. 55) was given its test run last Tuesday. . . . Two recently constructed earth dams have been equipped with facings of copper-bearing steel plates (p. 46), and engineers foresee an encouraging growth in the use of ¼ and ⅜-inch plates for this purpose. . . . Recognizing certain well defined properties of nitrided cast iron, including resistance to wear, a Michigan company is producing tubes of this material (p. 40) cast centrifugally. The tubes are used principally for liners for internal combustion engines, pumps, etc. . . . The confusing array of factors which influence the strengthening effect of threads on bolts (p. 30), suggests that some of the present methods of determining the strength of bolts should be modified or refined.

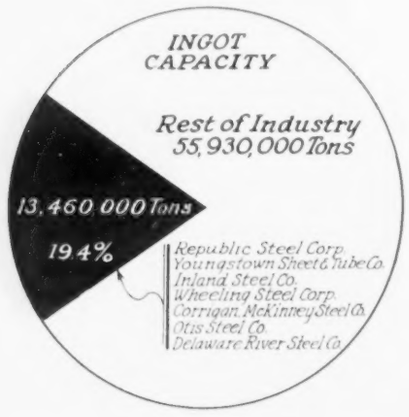
**Steel for Dams and Trains**

E. L. Shaner

# New Deal Fires on Republic Merger, Joint Directorships

REPUBLIC STEEL CORP. and the Corrigan, McKinney Steel Co., with its associated Newton Steel Co. and N. & G. Taylor Co., appear destined to go their own ways for an indefinite period as a result of a suit filed in Cleveland, Feb. 7, by the department of justice, attacking the proposed merger of these companies on the ground of violation of the antitrust provision (section 7) of the Clayton act.

Proceeding swiftly to block the consolidation, for which the requisite proportion of stock of the interested companies has been voted favorably, the department of justice will argue this week for a temporary injunction. On the basis of precedent, this undoubtedly will be granted.




Assuming that the defendant steel interests put up a contest and do not throw down their merger, a long drawn out court battle over a permanent injunction is probable. In the meantime, however, there would be no direct reaction on the iron and steel market situation, since the affected companies have not been cooperating and the suit is a preventive rather than an unscrambling one.

Also on Feb. 7 the department of justice brought action at Cleveland against seven individuals and ten iron and steel producing and holding companies, alleging the directorships of the seven men in the ten companies to be of an interlocking nature, in violation of section 8 of the Clayton act.

The individuals and their affiliated companies are listed as follows:

MYRON A. WICK, director of the Republic Steel Corp. and Delaware River Steel Co.

WILLIAM G. MATHER, chairman of the board of Corrigan, McKinney Steel Co. and director of Cliffs Corp., Cleveland-Cliffs Iron Co., McKinney Steel Holding Co. and Otis Steel Co.

S. LIVINGSTON MATHER, director of Corrigan, McKinney Steel Co., Cliffs Corp., Cleveland-Cliffs Iron Co., Youngstown Sheet & Tube Co. and Otis Steel Co.

D. T. CROXTON, director of Corrigan, McKinney Steel Co. and Otis Steel Co.

CYRUS S. EATON, director of Cliffs Corp., Cleveland-Cliffs Iron Co., and Inland Steel Co.

GEORGE T. BISHOP, director of Cliffs Corp., Cleveland-Cliffs Iron Co. and Inland Steel Co.

WILLIAM R. BURWELL, director of Cliffs Corp., Cleveland-Cliffs Iron Co. and Wheeling Steel Corp.

Concerning the reasons for the government's attack, the iron and steel industry is completely mystified. The ground, of course, is that a combination of Republic and Corrigan-McKinney would tend substantially to lessen competition. Except that both sell sheets, tin plate, bars, pig iron, and some semifinished steel, the products of the two units appear to supplement rather than overlap each other.

### SEC Report Costs Million

Since last August the merger has been under way; more than $1,000,000 has been spent in compiling the statement required by the securities commission (SEC); it has been understood that this statement was satisfactory; and no government objection was interposed until an investigation was started several weeks ago.

So far as size is concerned, Republic and Corrigan together would total 6,000,000 tons of ingot capacity, or 9 per cent of the country's aggregate capacity of 69,390,000 tons. This would be one-fourth of the present capacity of the United States Steel Corp. and two-thirds that of Bethlehem Steel Co., these two interests outranking Republic.

Several actions have been filed in New York and Cleveland to block the consolidation but wholly for the reason the fees being paid to banking interests for effecting the merger are too large. Republic is operating under the steel code and was recently given a clean bill of health by the national steel labor relations board in several cases involving collective bargaining.

There is equal mystification concerning the attack upon the seven directors and their alleged interlocking. Of the ten companies figuring in the action, two are holding companies and two are producers of pig iron only. Combined, these companies have an ingot capacity of 13,463,000 tons, or 19.4 per cent of the country's total, while their capitalization—about $740,000,000—is 18.5 per cent of the $4,000,000,000 invested in the iron and steel industry.

The links between these ten seem tenuous ones. Youngstown Sheet & Tube Co. is hailed into court because S. Livingston Mather is a director both of it and Otis Steel Co., while his uncle—William G. Mather—sits on the board of the Cleveland-Cliffs Iron Co. as well as the Otis Steel Co.—which is a typical example. Inland Steel Co., Wheeling Steel Corp., in fact all the other companies appear to be linked lightly, so far as the opinion of iron and steel executives generally is concerned.

Should the government be successful in its action, there would be no operating reaction on the industry but merely a severance by these directors of any overlapping posts on boards. Some of the overlapping is the result of the efforts of Mr. Eaton in 1929 and 1930 to put together a steel combine, of which Republic was the initial unit.

In the government's petition it is pointed out that the Cleveland-Cliffs Iron Co. owns all of the common stock of the McKinney Steel Holding Co. and 14,723 shares, or 1.31 per cent of the voting common stock and 94,652 shares, or 34.25 per cent of the non-voting common stock of the Corrigan, McKinney Steel Co.

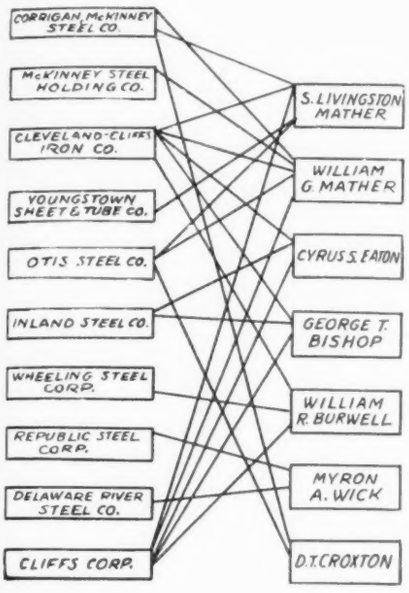
The McKinney Steel Holding Co. owns 616,212 shares, or 55.02 per cent of the voting common stock and 55,658 shares, or 20.13 per cent of the non-voting common stock of the Corrigan, McKinney Steel Co.

The Cleveland-Cliffs Iron Co. now owns 10,042 shares, or 5.4 per cent of Republic Steel Corp. common.

Other allegations set forth in the

petition are: In 1933 Republic made 85 per cent and Corrigan, McKinney 100 per cent of their semifinished steel sales in Michigan, Ohio, Pennsylvania, Illinois, Indiana and New York. In 1933 Republic sold 168,247 tons of merchant bars, or 7.1 per cent of the total production, and Corrigan, McKinney 121,058 tons, or 4.9 per cent.

In that year Republic sold 63.2 per cent of its bars, and Corrigan, McKinney 98.4 per cent in Ohio, Michigan, Pennsylvania, Indiana and New York.




In 1933 Republic sold 193,141 tons of sheets, or 6.1 per cent of the sheets produced for sale in the United States, and Newton Steel Co. sold 105,255 tons, or 3.3 per cent of the country's total, an aggregate of 298,396 tons, or 9.4 per cent of the national sheet production.

In 1933 Republic made 81.8 per cent of its sheet sales and Newton 99.3 per cent in Michigan, Ohio, New York, Pennsylvania, Indiana and Illinois.

In 1933 Republic sold 94,946 tons of tin plate and black plate, or 4.8 per cent of the total tin plate and black plate produced for sale in the United States, and N. & G. Taylor sold 19,989 tons or more than 1 per cent of the national production, an aggregate of 114,935 tons, or 5.8 per cent of the country's total tin plate and black plate production.

In 1933 Republic sold 301,240 tons of pig iron, and Corrigan, McKinney sold 304,919, a total of 606,159 tons, or 24.03 per cent of all the pig iron produced for sale.

Republic made 33.04 per cent and Corrigan, McKinney 99.85 per cent of their pig iron sales in Ohio, Michigan, Indiana, Pennsylvania, New York and Illinois.

In 1933 Republic produced for sale 301,240 tons of pig iron and Corrigan, McKinney produced for sale 206,035 tons, a total of 507,275 tons, or 20.1 per cent of the total pig iron produced for sale in the United States.

In 1933 Republic sold 105,933 tons of semifinished steel, including 29,137 tons of alloy steel, and Corrigan, McKinney sold 415,408 tons, including 198,222 tons sold to Newton Steel Co. and 15,792 tons sold to N. & G. Taylor Co., making the aggregate sales of Republic and Corrigan, McKinney 521,341 tons, or 16.2 per cent.

In Washington, Tom M. Girdler, chairman-president of Republic, and Donald B. Gillies, president of Corrigan-McKinney, issued this statement immediately following the filing of the suits:

We are amazed that the government has filed suit to prevent the merger of the Republic Steel Corp. and the Corrigan, McKinney Steel Co. Until we have had an opportunity to study the petition, we can make no statement as to the grounds or effect of the suit. However, from our knowledge of the situation we feel sure we should be able to satisfy any requirement of the law.

This proposed merger, which has the approval of the owners of more than two-thirds of Republic stock and 98 per cent of Corrigan, McKinney stock, has no purpose or effect in restraining trade.

As they stand, each company has certain deficiencies in plant and equipment which the other could supply. The sole purpose of the merger is to create a sound economic unit that could compete more effectively with the numerous other strong steel companies in the same territory. Thus competition would be increased, not diminished.

Furthermore, the merged company, through the greater efficiency that would result, would be able to play a more important part in the much-needed revival of the heavy industries which the government is trying to bring about.

Friday both presidents said their boards would meet in the next few days to consider action.

(*See also Page* 19)

# PWA

PRODUCTION of steel rails purchased in 1934 by railroad companies with PWA loans provided 21,000,000 manhours of indirect and industrial employment in all branches of the steel industry in addition to 5,500,000 hours of direct employment by railroad track forces to lay the rails. This 4 to 1 ratio of indirect to direct employment is exceptionally high.

Rails purchased by 19 roads with PWA loans in 1934 totaled 424,744 gross tons, out of 1,007,746 tons of rails rolled in 1934. About 30 per cent of the PWA rail purchases remain to be laid, in part accounting for the high ratio of indirect to direct labor.

## Human Interest in Equipment

**Machines were living things to the crowd of 35,000 persons attending the open house of the Allis-Chalmers Mfg. Co., West Allis, Wis., Jan. 19 (Steel, Jan. 28, p. 14). Shop practice and equipment in course of construction were described. Part of the crowd is shown above**

# Market Cheer Sound, Says Clarke at Del Monte; Conley Against Federal Inroads

THERE is more real substance behind the optimism being expressed today by the iron and steel industry than at any time in the past five years, declared N. J. Clarke, vice president in charge of sales, Republic Steel Corp., Youngstown, O., in addressing the annual meeting of the iron, steel and allied industries of California at Del Monte, Calif., Feb. 7. Analyzing various industries, Mr. Clarke pointed out:

The automotive industry has entered 1935 with dealer demand reflecting almost amazing consumer interest.

Farm implement manufacturers are unusually busy with orders from farmers who are in the best cash position in many months.

With only 12 years supply of crude oil in sight, the petroleum industry is facing increased demand, receding reserves and the necessity for renewed drilling activity.

The need of railroads for modern equipment, better rights of way and grade crossing elimination is so pressing that increased demand for steel is inevitable.

With the genuine shortage of suitable living quarters in many parts of the country and federal funds available in abundance, increased business in housing is bound to result.

### Advantages of Steel Code

As the chief commercial advantages resulting from enforcement of the steel code, Mr. Clark cited:

(1) Single price policy, (2) definition of jobber or wholesaler, (3) elimination of unfair trade practices, (4) extension and clarification of basing points, (5) restriction of new ingot capacity, (6) emphasis on salesmanship, quality and service instead of mere order taking by price cutting methods.

New uses for steel, according to Mr. Clarke range from mirrors for prison cells to protection against termites.

Difficulties in attempting to obtain a fair and workable code from NRA were enumerated by Clyde G. Conley, president of the Mt. Vernon Bridge Co., Mt. Vernon, O., and of the American Institute of Steel Construction, New York.

"This is a time when businessmen should stand together," Mr. Conley urged. "It is an emergency in industry no less acute than war. It will be a war we are certain to lose if we face the emergency disorganized.

"For more than a year and a half we have been operating under the NIRA. That law was written for the purpose of stimulating employment, but to induce business men to lend it their support we were promised an opportunity to outlaw cut-throat competition. Now that we have pledged ourselves to observe the labor restrictions, are the promises to end cut-throat competition to be abrogated?

"Certainly the government will not hold to that promise if the business people of the country are not united in their demand that all covenants be kept. It is even questionable if the government is going to support the profit motive in business, unless we are alert to our duties.

"In all seriousness I warn you that unless the business men of this country demonstrate their ability to cooperate jointly for the betterment of social conditions in the United States we can expect even more drastic governmental inroads into our private affairs than the people of this nation have ever dreamed of.

### For a Limit on Profits

"If business is to be allowed to continue enjoying profits, those profits must be limited and not allowed to expand to satisfy the greed of investors. Profits must be divided with labor. As a concession to the improvement in organizations and the technological advances in production, the work week must be reduced, so that labor can also enjoy more leisure. Discriminations, secret rebates, undercutting to obtain customers, and the multitude of other discredited practices must be done away with. None of the codes has as yet found a practical way of doing it.

Walter S. Doxsey, executive secretary, American Steel Warehouse association, Cleveland, spoke on "The Distributor's Place in the Steel Industry," maintaining that the warehouse meets a necessary requirement of consumers and urging the closest of relationships between the steel warehouse and the mills. The warehouse cannot function as it should and render the wide range of service demanded by customers if there are unsound and unreasonable fluctuations in prices, he insisted.

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# Automobile Code

PRESIDENT Roosevelt ignored five out of six recommendations of the Henderson committee, which was investigating the automobile situation for NRA, and in extending the automobile code with practically no change he accepted only the suggestion that the introduction of new models be moved back to early fall in order to regularize employment.

Named after Leon Henderson, member of the industrial recovery board and director of the NRA research and planning division, the committee recommended a reduction in the maximum work-week from 48 hours to 40; reform of labor practices to eliminate espionage, speed-up, low annual earnings and inequitable re-hiring methods; extension of facilities for collective bargaining, in effect calling for elimination of the Wolman labor board based on the proportional method; co-ordinated reforms of sales and purchasing methods to relieve destructive pressure on dealers and parts makers.

The extreme bitterness following the President's extension of the code from Feb. 1 to June 16, expressed by labor leaders, results largely from the President's passing over the Henderson recommendations and prolonging the life of the labor board he himself set up in the fall of 1933 to avert a threatened strike.

It is pointed out that the big three—Ford, General Motor and Chrysler—produced 88 per cent of the automobile output in 1934, compared with 77 per cent in 1929. A noteworthy trend toward the $500 class is also pointed out. This concentration of volume "should not be accelerated by the government" the committee warns.

The Henderson committee also found in regard to labor that unrest exists to a degree higher than warranted by the depression, the power of foremen is disturbing, espionage systems exist in most plants, workers are considered old at 40, hourly earnings are high but annual income low, averaging hours on an annual basis is neither necessary nor desirable.

# NRA

CONFERENCES between the President and administration leaders in both houses of congress lead to the impression that an extension of NRA, which expires June 16, into 1937 is planned with comparatively few modifications.

It is important to note that the program seems to be one of extension for two years rather than on a permanent basis, and that NRA is to be retained as an independent body rather than scattering its functions among the federal trade commission and the department of justice.

Legislation extending NRA appears likely to declare a policy contrary to price fixing but to retain price control under government supervision, which apparently would mean continuation of the present pricing system for the iron and steel industry.

On the matter of maximum hours and minimum wage rates, little change appears to be in prospect, and

for iron and steel the present 40-hour week, with a permissible peak of 48-hours, probably will hold over. If the 30-hour week occurs it will be through congress and not NRA.

Legislation to continue NRA probably will be introduced in the house shortly and will be handled by the ways and means committee.

Last week NRA announced that the actual cost of administering all codes is probably $41,400,000 a year. With an average assessment rate of 10/65 of 1 per cent of the volume of sales by coded industries, the actual experience of 352 approved budgets (out of about 400) is that assessments total $38,118,000, applied on $70,380,000,000 worth of business.

## Labor

NATIONAL steel labor relations board is expected to reopen the case of the Amalgamated Asociation of Iron, Steel and Tin Workers against the Jones & Laughlin Steel Corp. in which charges of coercion and interference were made at its Aliquippa, Pa., plant. A recent decision exonerated the company from trespassing on section 7a of NIRA, but asked for the reinstatement of certain employes.

Wheeling Steel Corp., Wheeling, W. Va., in the first week of February reached a new high for employes on its payrolls. This record total was 18,329, or 488 more than the 1929 peak, which was in April.

By years, Wheeling's annual high in employment has been: 1935, February, 18,329; 1934, June, 18,128; August, 17,793; 1932, October, 10,573; 1931, April, 14,428; 1930, April, 18,244; 1929, April, 17,841.

# Amalgamated Civil War Opens with Bloodless Bull Run; Expulsions Follow

A WEEK ago Saturday afternoon, about 500 men and boys —their interest steel—gathered in a school field at Rankin, Pa., mill-working town and Pittsburgh suburb.

More specifically, they gathered around an improvised rostrum where, between American flags, stood and spoke heavy-set William J. Spang, president of district 1, Amalgamated Association of Iron, Steel and Tin workers, also erstwhile worker in Carnegie Steel Co.'s nearby Duquesne works.

Bareheaded, Spang harangued, and so fired the opening gun in a "rump" meeting against the alleged do-nothingness of Amalgamated executives, more specifically against Michael F. Tighe, the union's 76-year-old leader. Rumblings of an Amalgamated split, heard for some months, had for the first time come out in the open.

The left-wingers, of which Spang is one ringleader, thus vocally set the ball rolling for the 30-hour week, $1 hour minimum wage, and at the same time took occasion not only to protest Mr. Tighe's standpat policies but also the branding he had recently hurled at their number when he dubbed militant members "communists" and "reds".

"Tighe is not the boss; the rank and file membership of the Amalgamated is the boss and Tighe is our servant," thundered Spang.

"We are fighting not only the United States Steel Corp. but also our own organization and for our rights. It may be called communism, radicalism, or any other 'ism', but I call it Americanism. We'll hold our meeting tomorrow in Pittsburgh, in spite of Pat Fagan or anyone!"

This pep rally over, next day, Sunday, Feb. 3, in spite of Pat Fagan, who as district president of the United Mine Workers, also frowned with Amalgamated President Tighe on the unofficial character of the movement, there gathered in downtown Pittsburgh about 500 steelworkers and 100 coal miners, bent on voicing their sentiments. At first they were barred from the Elk's temple, but later found a haven in the Moose temple.

Clarence Irwin, Youngstown, O.; L. A. Morris, Canton, O.; Spang, Martin Ryan and others took the floor, reiterating the protests Spang had touched on the day preceding.

### "To Strike at Key Mills"

"The steelworkers from their own experience know that they can secure no help in their struggles from the labor board or other federal agencies," stated one of the petitions adopted. "Their only defense against long hours, low wages and intolerable working conditions is the power of their own organization, exercised by the calling of strikes, if and when necessary."

"When we are ready, we intend to strike at the key mills," one of the speakers said. "And it won't be hard to draw in the smaller outside mills. We must cultivate public opinion. One cause of the failure of the 1919 strike was that we allowed our enemies to discredit us in the public eye by dubbing us, 'I. W. W.'."

Their Sunday's wrath thus spent, it was not long before Amalgamated headquarters closed in on the insurgent rank and filers.

"All lodges were warned before this meeting," Louis Leonard, secretary of the Amalgamated, said on Monday, Feb. 4. "All those we are sure attended the meeting Sunday will be expelled at once; others will be dismissed just as soon as we are sure they participated."

Thus, the Amalgamated sent out summarily terse notices of expulsion to the men who took part in the outlaw meeting and also took steps to revoke the charters of several

**At left is William Spang, "rank and file" leader of the Amalgamated, on the stump at the "rump" meeting at Rankin Feb. 2. At the right is part of the crowd of 500 all of whom, according to Amalgamated officials, will be expelled.**
**Photo courtesy of Pittsburgh Press**

lodges. Amid the purge, witnessing the first wide-open split in steel union ranks, the steel industry looked on querulously at the statement, "We must cultivate public opinion" and became more certain than ever that a house divided against itself was spending its threat.

# Production

STEELMAKING operations held unchanged last week at 54½ per cent after nine successive weeks of improvement. Declines scheduled in several districts this week may drop the rate slightly. A reaction would not be uncommon after such a sustained period of improvement. In the trade there is a disposition to ascribe the current softness in demand to uncertainty over the gold clause and it is believed that whatever the decision may be, steps to extend the present value of the dollar will be taken, and steel will again resume its upward march.

Unchanged at 44 per cent last week, Pittsburgh operations are expected to decline 2 points to 42 per cent this week, due primarily to a slight curtailment in steel specifications for immediate rolling, plus the suspension of rolling operations at the rail mill beginning this week. Twenty-three blast furnaces continue in operation and possibilities favor resumption of blast in a Clairton furnace of Carnegie and an eighth Jones & Laughlin stack. Buffalo also held steady at 45 per cent with an increase likely toward the end of the month, although producers are reluctant to add new finishing mills until longer schedules can be arranged.

Although one leading mill in the Wheeling district continues at capacity, another interest reduced its steelmaking operations slightly, bringing the rate down 5 points to 90 per cent. Of the 33 open hearths active, two are of small capacity which accounts for a weighting in the average. With plans for six additional open hearths being started up this week, the Birmingham steelmaking rate will jump 23½ points to 55½ per cent. Rail mill operations at the Ensley works will require large quantities of steel, with orders in hand calling for more than 50,000 tons of rails.

Youngstown steel output last week dropped 6 points to 58 per cent but is expected to rebound to 59 per cent at this week's start. Youngstown Sheet & Tube Co. plans to resume melting late this week in its three Brier Hill open hearths, idle four years.

Cleveland was up 4 points, Corrigan, McKinney Steel Co. operating 13 open hearths, Otis Steel Co. 8, and National Tube Co. at Lorain, 11. One and possibly two units may be taken off this week for repairs. Rising 1 point to 67 per cent, Chicago reached a new high for the year, and there are no indications of an early drop.

Eastern Pennsylvania was up 1 point to 31 per cent. One producer has changed a policy of producing steel only in alternate weeks, and contemplates a regular schedule of a stipulated number of open hearths in operation each week for a period of three days.

## Steelmaking Operations

Percentage of Open-Hearth Ingot Capacity Engaged in 10 Leading Districts

| | Week ended Feb. 9 | Change | Same week 1934 | Same week 1933 |
|---|---|---|---|---|
| Pittsburgh | 44 | None | 21 | 18 |
| Chicago | 67 | + 1 | 37 | 19 |
| Eastern Pa. | 31 | + 1 | 24½ | 11 |
| Youngstown | 58 | — 6 | 44 | 21 |
| Wheeling | 90 | — 5 | 69 | † |
| Cleveland | 82 | + 4 | 74 | 36½ |
| Buffalo | 45 | None | 37 | 13 |
| Birmingham | 32 | None | 52 | 19 |
| New England | 63 | +11 | 82 | † |
| Detroit | 100 | None | 79 | † |
| Weighted av. | 54½ | None | 39 | 19 |

†Not reported in 1933.

### INGOT GAIN IS 40 PER CENT

At 2,834,170 gross tons, production of open-hearth and bessemer steel ingots in January was ahead both of last December and of January a year ago by approximately 1,000,000 tons or 40 per cent. January's daily average was 104,969 tons, compared with 77,664 tons in December and 73,007 tons a year ago January, according to the American Iron and Steel institute.

Related to capacity, January was a 47.67 per cent month, which compares with 35.27 per cent for December, 33.16 per cent for January a year ago and an average of 36.89 per cent for all 1934. The increase of February this year over February last year will be even greater than the spread of January over last January.

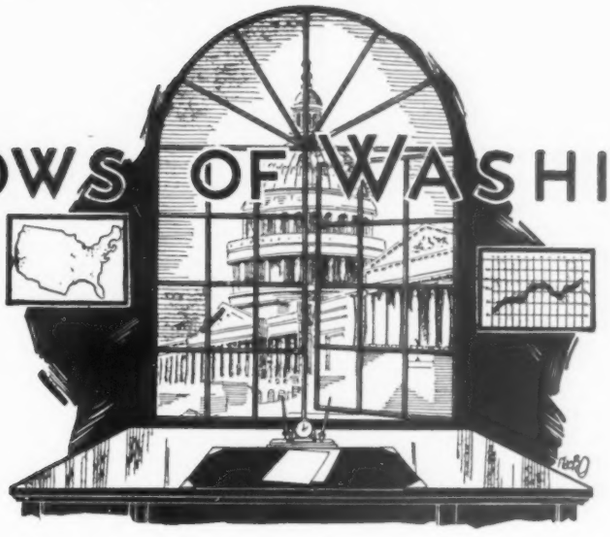
## Production of Steel Ingots Shows Increase of 900,000 Tons in January

**Reported by Companies which in 1933 Made 99.32 Per Cent of Open-Hearth and 100 Per cent of Bessemer Total**

| | Reported Production — Gross tons | | Calculated Monthly Production — All Companies — Open Hearth | | Bessemer | | Total | | Calculated daily production, all companies | No. of working days |
|---|---|---|---|---|---|---|---|---|---|---|
| 1934 | Open hearth ingots | Bessemer ingots | Gross tons | Per cent of capacity | Gross tons | Per cent of capacity | Gross tons | Per cent of capacity | Gross tons | |
| January | 1,786,467 | 172,489 | 1,798,698 | 34.20 | 172,489 | 25.17 | 1,971,187 | 33.16 | 73,007 | 27 |
| February | 1,993,638 | 175,873 | 2,007,287 | 42.93 | 175,873 | 28.87 | 2,183,160 | 41.31 | 90,965 | 24 |
| March | 2,540,143 | 203,904 | 2,557,534 | 48.63 | 203,904 | 29.75 | 2,761,438 | 46.45 | 102,275 | 27 |
| First quarter | 6,320,248 | 552,266 | 6,363,519 | 41.88 | 552,266 | 27.89 | 6,915,785 | 40.27 | 88,664 | 78 |
| April | 2,622,372 | 257,482 | 2,640,326 | 54.22 | 257,482 | 40.57 | 2,897,808 | 52.64 | 115,912 | 25 |
| May | 3,000,624 | 331,620 | 3,021,168 | 57.44 | 331,620 | 48.38 | 3,352,788 | 56.40 | 124,177 | 27 |
| June | 2,714,983 | 282,592 | 2,733,571 | 53.97 | 282,592 | 42.81 | 3,016,163 | 52.68 | 116,006 | 26 |
| Second quarter | 8,337,979 | 871,694 | 8,395,065 | 55.25 | 871,694 | 44.02 | 9,266,759 | 53.96 | 118,805 | 78 |
| July | 1,343,732 | 119,869 | 1,352,932 | 27.78 | 119,869 | 18.89 | 1,472,801 | 26.76 | 58,912 | 25 |
| August | 1,245,445 | 109,598 | 1,253,972 | 23.84 | 109,598 | 15.99 | 1,363,570 | 22.94 | 50,503 | 27 |
| September | 1,126,415 | 117,580 | 1,134,127 | 23.29 | 117,580 | 18.53 | 1,251,707 | 22.74 | 50,068 | 25 |
| Third quarter | 3,715,592 | 347,047 | 3,741,031 | 24.94 | 347,047 | 17.75 | 4,088,078 | 24.11 | 53,092 | 77 |
| October | 1,325,225 | 127,789 | 1,331,298 | 25.37 | 127,789 | 18.64 | 1,462,087 | 24.59 | 54,151 | 27 |
| November | 1,447,297 | 132,059 | 1,457,206 | 28.77 | 132,059 | 20.01 | 1,589,265 | 27.76 | 61,126 | 26 |
| December | 1,797,830 | 131,456 | 1,810,139 | 37.17 | 131,456 | 20.71 | 1,941,595 | 35.27 | 77,664 | 25 |
| Fourth quarter | 4,570,352 | 391,304 | 4,601,643 | 30.28 | 391,304 | 19.76 | 4,992,947 | 29.07 | 64,012 | 78 |
| Total | 22,944,171 | 2,162,311 | 23,101,258 | 38.13 | 2,162,311 | 27.39 | 25,263,569 | 36.89 | 81,233 | 311 |
| 1935 | | | | | | | | | | |
| January | 2,576,671 | 239,858 | 2,594,312 | 49.32 | 239,858 | 34.99 | 2,834,170 | 47.67 | 104,969 | 27 |

Capacity calculated on annual capacities as of Dec. 31, as follows: Open-hearth, 60,583,813 gross tons, Bessemer, 7,895,000 gross tons.

# WINDOWS OF WASHINGTON



*WASHINGTON*

IF NOTHING else, the suit filed in Cleveland Friday to halt the Republic - Corrigan, McKinney - Truscon merger keeps steel "on the spot" and public opinion concerning the industry churned up—which some regard as one of its objectives.

The angle to the action involving interlocking directorates ties up with the administration's complex on holding companies, which thus far has been vented only on public utilities, but it has possibilities and suggests that steel's business may make it vulnerable.

Certainly steel has been under suspicion, if not attack, all through the Roosevelt administration. In the spring of 1933 the attempt to break the price of rails culminated in the President himself virtually forcing a compromise at $36.37½, after threats that the government might have to get into the business itself to develop a "yardstick."

### HARASSED ON OTHER FRONTS

From the start, the relations of steel to its labor have been under fire, and efforts to organize the industry patently have had the blessing of the new deal. There is this, however, to be said for the labor situation: The industry's willingness to effect a truce, stopping short only of a closed shop, commanded respect at the White House.

In extending the steel code last May 30 the President ordered an investigation of the basing point situation by both the federal trade commission and NRA. Although the trade commission of 1924 was delighted to get from the industry only a fraction of the basing points now set up by the code, the undercurrent of agitation has been kept active, and the commission has been pinpricking steel, apparently under orders from outside.

In a less conspicuous fashion the Tennessee Valley Authority has been prodding steel. At one time it planned to embark on the production of ferromanganese from domestic manganese ore, which would have been a pet shot at the big steelmakers and their preference for foreign manganese. Lately there have been suggestions that TVA would make stainless steel, and now it is talking about erecting a 350-ton blast furnace near Knoxville, Tenn., to smelt local phosphate ore. In all this there is an inference of laxness by the industry.

This guerilla warfare against steel, if it can be termed that, is typical of a peculiar atmosphere generated at Washington by the new deal. The new dealers' concept of steel is a feudal industry that threats its labor like serfs, that congenitally is standpat Republican and pro-tariff, whose executives wallow in large salaries and bonuses. Even newspaper correspondents delight frequently in sly digs at the industry—partly because steel executives lack a sense of public relations.

There is nothing at the moment to connect the attack on interlocking steel directorates with any companies not specifically mentioned in the Cleveland suit, but it is known that some economists have been dallying with the theory that there is a lot of "water" in certain steel stocks and that if it were squeezed out these companies would make a comfortable showing at current prices and volume.

### MAY AFFECT CORP. PLANS

It will be interesting to observe whether the disclosure of the government's attitude will affect the program which the United States Steel Corp. has been shaping up for its organization, which by all odds is the most widespread of the industry. Only occasionally have there been public references to it, but the industry has been expecting some recasting of the Steel corporation, most likely through grouping either sales or production facilities, or both, in the Pittsburgh and Chicago districts. In the South, for example, the Tennessee Coal, Iron & Railroad Co. subsidiary of the Steel corporation has been effectually reorganized. Several years ago it took over the American Steel & Wire Co. properties at Fairfield, Ala. Recently it assumed the Carnegie Steel Co.'s cotton tie business in the South. Now it is taking over the sheet business of the American Sheet & Tin Plate Co. in the South—all of these companies also being Steel corporation subsidiaries.

Much of this concentration of Steel corporation subsidiary activity has been under the aegis of Robert Gregg, who last month left the presidency of the Tennessee company to become vice president in charge of sales for the Steel corporation in New York. The trade assumes that the logic behind the concentration of Steel corporation activity in the South in one unit applies equally to the Chicago and Pittsburgh districts.

### WHY PICK ON REPUBLIC?

If the steel suits are related to the new deal's undisguised sympathy for smaller units of industry, the group of companies pounced upon are merely victims because they figure in the proposed Republic merger or have some connecting directors.

The combined ingot capacity of the companies in the current action (p. 14) is only 19.4 per cent of the country's total, and their combined capitalization 18.5 per cent of the four billions invested in iron and steel.

The Steel corporation alone rates 39 per cent of the country's capacity, or twice that of the seven in question, most of whom are dragged into the action by the questionable margin of one director. Bethlehem, with 13½ per cent of ingot capacity, is almost as large as the unfortunate seven. And one of the seven has no steelmaking capacity; Delaware River Steel Co. is a pig iron producer solely.

It could not be stated conclusively

that the Roosevelt administration is against big business or mergers or economical concentration of interests, yet there is an underlying feeling that the small unit is close to its heart. In the case of public utilities, the animus is directed against the holding corporations and not against the smaller operating companies. In some cases the administration is actually in favor of bigger business, such as consolidation of the railroads and the various communication companies. In fact, the automobile manufacturers are the fair-haired pets of the administration. But steel needs to be on its guard.

### POSTPONEMENT LIKELY

So far as the Republic merger is concerned, the result of the suit may be to postpone it indefinitely, and there are prospects of the action being in the courts a long time. This is especially true if the trade commission is any criterion. On Jan. 26, 1923, the commission filed a complaint against the Bethlehem Steel Corp. for acquiring the Lackawanna Steel Co., Cambria Steel Co., Lackawanna Bridge Works Corp. and Midvale Steel & Ordnance Co., and in 12 years that case has not been disposed of.

In the meantime Bethlehem has taken over the McClintic-Marshall Corp., Kalman Steel Co. and several other fabricators of structural shapes and reinforcing bars, without incurring the official displeasure of the trade commission or any other federal agency. And the basis for action 12 years ago was largely parallel to that in the current Republic suit—unfair competition through lessening potential and actual competition contrary to the Clayton and federal trade acts.

HAVING the national steel labor relations board effectively bottled up for some months through the various court actions contesting the board's demand for payrolls, which are prerequisite to holding elections for collective bargaining, steel can complacently occupy its ringside seat at the battle royal between the administration and organized labor.

So far as pure merit is concerned, the industry should be in the administration's corner; practically every recent move by it could be applauded by the industry. But the memory of how the administration turned labor loose on steel is too fresh, and there is just a shade of sportsmanship feeling that labor is now fighting for the bait the administration dangled before it and could not deliver.

One word—frustration—accurately describes the innermost sentiment of organized labor. The President, Senator Wagner, General Johnson, Co-ordinator Richberg, NRA and the various labor boards have, by some means or other, intimated to labor that under section 7a of the recovery act it had the right-of-way to organize industry. Probably the administration thought that industry would prove easy picking in its prostrate state.

In any event, industry did not fall like a house of cards before labor's blasts. Of the 400,000 employes in the steel industry, only 6500 voted for officers of the Amalgamated Association of Iron, Steel and Tin Workers in last September's elections, and that union is now torn wide open by dissension (p. 17). Of the 60,838 ballots cast in the first ten nominating elections held by the automobile labor board, American Federation of Labor candidates have polled exactly 2486 votes.

For this condition, labor blames the administration. It feels that in some manner there should have been the equivalent of compulsion. It is disturbed because it does not have representation on most code authorities. It writhes because most codes prescribe a 40-hour work week, when labor wants 30; actually, employment has not averaged much over 32 hours the past year. But much of the present bickering can be ascribed to a sudden galvanizing into action by so-called conservative leaders, who fear radical minorities, such as in the steel union.

### TURN AGAINST OWN MEN

The President has given labor two separate boards in automobile and steel—the former an impartial one and the latter according labor distinct representation. And neither has satisfied it. Against Dr. Leo Wolman and Co-ordinator Richberg, both with distinct labor backgrounds, William Green and John Lewis are hurling invectives; they are turning against their own kind. The President has ridden with both the hares and the hounds, and neither has been pleased with his company.

It still is the case that labor's principal weapon at this time, especially in the automobile and steel industries, is minorities. A few "key" departments in many works could tie them up completely. Other than this, there is no noteworthy concern over strikes.

Labor affords just another example why an alien unfamiliar with the vagaries of the American political system would find utterly inexplicable recent developments within an administration that is supposed to have an unbreakable grip on the public imagination and within a congress that is overwhelmingly Democratic.

Organized labor, supposed to be the pet of the administration, has become its severest critic, and the bitter words hurled at Co-ordinator Richberg are only an oblique attack upon the chief executive. In 1933 it would not have been believed possible, but the administration now has satisfied neither industry nor labor.

Two weeks ago the senate voted down the President's resolution for adhesion to the world court. A senate committee came within a single vote of converting the $4,800,000,000 work relief measure into the equivalent of a dole. A Democratic minority in the house has rebelled successfully against "gag" rule.

Senator Carter Glass, financial expert of the senate, has been grievously wounded by being ignored in the drafting of the new banking bill, which may have a kickback. The fact is, the influence of Huey Long is spread sufficiently to worry the administration greatly. The best that could happen for industry would be a stalemate, which would leave industry free to build up recovery, and after it arrived no one would care what happened in the transitional period.

AS IF it does not have enough trouble on its hands with the breakdown of negotiations with Russia and trying to keep a halter on George Peek, special foreign trade adviser, the state department has walked into a hornet's nest in lowering the duty on manganese ore from Brazil. If there is any persistent group fighting for a domestic industry it is that of manganese producers and the congressional delegations from manganese-producing states.

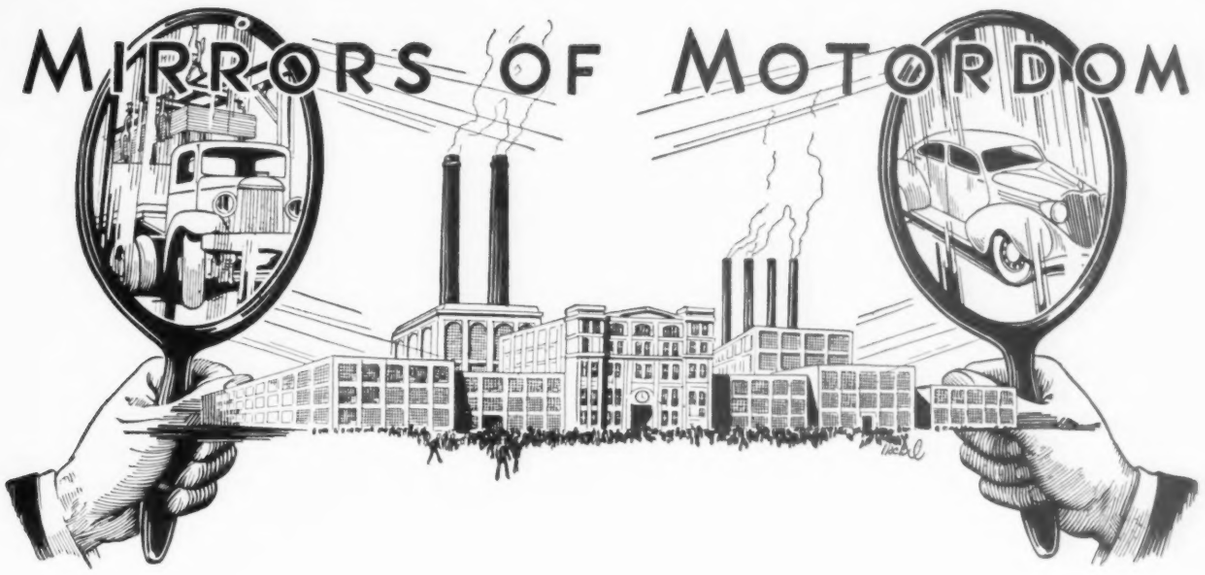
Under the new reciprocal tariff arrangement with Brazil, the duty of 1 cent a pound on contained metallic manganese is exactly halved. And to make matters worse, in explaining this adjustment to induce Brazil to buy more American products, the state department's explanation is that in the last ten years domestic manganese mines have supplied only a fraction of the total of manganese required by the steel industry, full time operations would require not more than 100 to 200 men, and in general inferring that the domestic industry is a negligible factor.

### PROTESTS ARE CRYSTALLIZED

Secretary Hull's action has galvanized the manganese bloc into action. A caucus was held last week by members of the house and senate to express indignation. A resolution proposed by Senator Murray, of Montana, proposes that "most favored nation" treatment be excluded from reciprocal tariff concessions.

Senator McCarran, also of Montana, has protested at the White House, pointing out that the concessions to Brazil might have to be extended to Russia and South Africa, the biggest shippers to the United States and thereby threatening to wipe out the entire domestic industry.

Steel producers who in past years have been the butt of the wrath of domestic producers are on the sidelines, seeing whether the state department can take it as well as they have.




*DETROIT*

WITH the show tinsel packed away and the initial blasts of new model publicity and advertising sounded, manufacturers are settling down to the business of making and selling automobiles. Results so far have been gratifying to the majority of the industry. Sales have risen substantially and in most cases have kept pace with the sharp gain in production. Several companies still are behind on deliveries.

The outlook continues promising for the remainder of this quarter at least, and usual expectations are for the best year's output since 1930's production of about 3,500,000 units. Here and there, however, there is a tendency for sentiment to lean away from the bullish flavor which greeted the year's opening.

### FRET OVER STOCK MARKET

A large part of this divergence can be traced to the failure of security prices to respond to the rapid recovery in automobile output. Stock market-conscious to a large degree, Detroit recognizes the effect rising prices have upon car sales and does not like the manner in which security values have lagged nor the uncertainty which has caused it.

Steel orders have slackened somewhat so far in February, but most sellers look for the latter part of this month to witness a recovery which will set the peak in buying for the year. This is based on the belief that automobile output will continue to rise through April under the force of expanding schedules of Ford and Chevrolet.

Some manufacturers, off to a good start in December in dealer-stocking, are likely to reach their best production in March, if not sooner. With five Saturdays and five Sundays, March has only a two-day advantage in number of working days over the present abreviated month.

Chevrolet built about 60,000 cars and trucks in January, only 4000 of which were master models. The latter will receive greater emphasis this month, however, and total production is expected to show a gain of at least 50 per cent.

Ford is bending every effort to catch up with the best demand it has experienced since the depression started, and hopes to better its projected schedule of 130,000 units this month. March production, from present indications, will be set around 180,000. Touring sedans with built-in trunks in two and four-door sedan models are just commencing to come off the assembly lines.

Plymouth operations continue at virtual capacity, around 12,000 weekly, with January production estimated at about 50,000 units. Both retail sales and assemblies have been nearly three times the volumes a year ago. Output of the entire Chrysler Corp. to date makes an exceptional record compared with last year, partly because early in 1934 Chrysler and DeSoto were unable to start regular assemblies of airflow models. Additions of new series not built last year also swells the total. With January production of about 80,000 units, Chrysler shows the largest gain of the Big Three compared with the 1934 month.

### THREE STILL SET PACE

While Ford's big lead over Chevrolet so far this year gives the former long odds in the 1934 race as a whole, early figures on registrations indicate no important changes in relative position of the two compared with the situation a year ago when Chevrolet fell behind the production parade through delays incident to the adoption of knee-action springs.

New car registrations in Chicago and Cook county in January, for example, totaled roughly 5000 cars against 2000 last year. Ford totaled 26.5 per cent of this number, Plymouth 19.3 per cent and Chevrolet 12.3 per cent. These percentages are almost identical with the ones prevailing a year ago. A similar trend is noted in Detroit and Wayne county.

REACTIONS are somewhat divided to the plan to advance introduction of new models from January to fall, some seeing merit in it while others consider it of little consequence. In general, the idea is believed worth trying, though it is doubted whether public buying habits can be altered sufficiently to prevent spring and summer months

## Automobile Production

Passenger Cars and Trucks
U. S. Only
By Department of Commerce

| | 1932 | 1933 | 1934 |
|---|---|---|---|
| Jan. | 119,344 | 128,825 | 156,907 |
| Feb. | 117,418 | 105,447 | 231,707 |
| Mar. | 118,959 | 115,272 | 331,263 |
| Apr. | 148,326 | 176,432 | 354,745 |
| May | 184,295 | 214,411 | 331,652 |
| June | 183,106 | 249,727 | 308,065 |
| July | 109,143 | 229,357 | 266,576 |
| Aug. | 90,325 | 232,855 | 234,810 |
| Sept. | 84,150 | 191,800 | 168,171 |
| Oct. | 48,702 | 134,683 | 132,491 |
| Nov. | 59,557 | 60,683 | 78,465 |
| Dec. | 107,353 | 80,656 | 183,187 |
| Year | 1,370,678 | 1,920,057 | 2,778,739 |

Estimated by *Cram's Reports*

| | |
|---|---|
| January | 280,000 |
| Week ended Feb. 9 | 78,453 |

from continuing to be the active season for sales.

The first year of the adoption of the plan will work some hardship on those manufacturers who have invested the heaviest in tools and dies for current models, since usefulness of this equipment will be spread over a curtailed period.

For this reason it is believed that a number will resort to only minor changes in designs of cars introduced in November, reserving major revisions for 12 months hence if the procedure continues in force. The tool and die industry will be revived at an earlier date than usual.

Buick, Cadillac and LaSalle, with practically no changes in 1935 models, are expected to offer new cars before the fall showing. They would then be in a position to let these models ride through until the latter part of 1936. General Motors to a certain extent has kept to its announced intention of spreading its introduction of new cars over the year. Pontiac and Oldsmobile were the only units which had production of new cars well under way early in January. Master models of Chevrolet are about a month behind comparable makes in reaching dealers.

**MAY DELAY STYLE CHANGE**

Chevrolet has been criticized for the lack of revision in the exterior of its cheaper line, but the company believes there is a large market among car owners to whom the lowest initial and upkeep cost is the prime consideration. In view of General Motors' approval of the plan to stagger offerings of new cars, there has been the suggestion that a standard Chevrolet redesigned from the standpoint of appearance might be looked for in the summer in the event sales do not come up to expectations. The agreement of the industry with Washington to launch its new products in the fall, however, might make it desirable to reserve changes until then.

Buick, Cadillac and LaSalle are expected to adopt the steel turret top on next model changes. Since the fabrication of this section involves presses and dies of unusual size, to say nothing of the steel sheets required, the difficulties that would have been encountered had all of the GM units simultaneously adopted this type of roof are obvious.

While saying nothing on the subject, other than its emphasis on steel, Fisher is expected to drop wood completely as a composite part of its bodies on subsequent designs. The concentration by other manufacturers on the term "all-steel" has been effective in making this construction important from the standpoint of safety in the public's mind. Fisher's ads of a short time ago claimed a combination of steel and wood superior to steel alone. Now they feature the similarity between automobile tops and gun turrets, yet wood long ago was dropped as supporting members of a battleship hull.

Medium-price cars generally are sharing in the better retail demand to a relatively equal extent as are the cheaper models. Hupp reports 1300 unfilled orders as of the first week in March, three times as many as a year ago. Other makes, such as Graham, Nash and Studebaker, also are selling substantially better.

**ORGANIZERS LOSE GROUND**

The labor situation as it affects the automotive industry is brighter with the apparent settlement of differences between plate glass plants and their workers and the setback given demands of the American Federation of Labor through the code extension. At least temporarily squelched, the federation does not intend to give up without a fight, however, as indicated by the tenor of protests of its leaders against the presidential edict on the code. A demonstration by the organization is planned here for Feb. 23, speeches by President Green and others to be broadcast.

Pickets continued last week outside the Murray plant where maintenance men, who walked out recently, have been replaced. Manufacturers expect a continuation of sniping at "key" departments by the disgruntled organizers, but see safety in the support of the large number of workers who have disclaimed affiliation with the parent labor body.

## January Iron Production Better Than Reported

Actual production of coke pig iron in the United States in January proved to be approximately 2000 tons better than was indicated by the preliminary figures published in STEEL last week. Although the previous compilation was remarkably close, it had included producers' estimates of output for the last two or three days of the month. The number of operating blast furnaces stood.

According to complete reports, total production for January was 1,478,443 gross tons, this being an increase of 450,437 tons, or 43.8 per cent, over the 1,028,006 tons made in December. Average daily production at 47,692 tons was 14,531 tons, or 43.8 per cent, greater than the 33,161-ton rate of December.

Of the total output, 1,333,049 tons was of nonmerchant or steelworks classification, 145,394 was merchant.

Active blast furnaces on Jan. 31 totaled 89, a gain of 22, over the 67 making iron on Dec. 31. In addition to the January stack changes listed last week, Jones & Laughlin Steel Corp. placed in operation another Eliza furnace in Pennsylvania, and Ford Motor Co. took its Benson furnace in Michigan out of blast.

# Died:

JOHN A. LOWRY, 54, president of the Northwest Magnesite Co., and the Thermax Corp., in Pittsburgh, Jan. 31. Born in Friendship, O., he entered the employ of Harbison-Walker Refractories Co. in 1903. He went to Pittsburgh in 1933, when he was made president of the Northwest Magnesite Co., a subsidiary of Harbison-Walker.

□ □ □

August Koenig, 58, president of the Hoboken Iron Works, in Hoboken, N. J., Feb. 5.

□ □ □

F. Conrad Wittich, 65, president of the Cleveland Tool & Supply Co., Cleveland, in that city, Feb. 6.

□ □ □

Charles S. Reed, 66, president of the Chicago Retort & Fire Brick Co., Chicago, in that city Feb. 5.

□ □ □

James G. Hope, 58, for many years superintendent of the Covert Gear Co., Lockport, N. Y., Feb. 1.

□ □ □

John F. Gail, 62, vice president and consulting engineer for the Simmons Bed Co., Kenosha, Wis., in Evanston, Ill., Jan. 30.

□ □ □

Louis C. Cassinelli, 65, president of the Midwest Supply Co., Cincinnati, and representative in Cincinnati of the Peerless Machinery Co., recently.

□ □ □

Louis G Beers, 72, formerly sales manager of the New Jersey Wire Cloth Co. prior to its merging with the John A. Roebling's Sons Co., Trenton, N. J., at his home there, Jan. 31. Active in the industry for 28 years, he had retired in 1928.

□ □ □

John E. Fisher, 70, pioneer Lima, O., industrialist, in that city recently. When the Ohio Steel Foundry Co. was organized in 1911 he was appointed consulting engineer. In the past 40 years he had developed many refinements in the casting of steel, one the Fisher sideblow converter.

□ □ □

George Lerch, 69, co-partner in Lerch Bros., chemists, Virginia, Minn., in Rochester, Minn., Jan. 28. He began his professional career as a chemist for the Bethlehem Steel Co., continuing with that company until 1892, when he and his brother began business as independent chemists.

□ □ □

Frank O. Bumbaugh, 71, president of the Monessen Foundry & Machine Co., Monessen, Pa., in that city, Feb. 2. He was a pioneer citizen of the city and established the foundry and machine company in 1898 with his brother, the late W. S. Bumbaugh. He served as a member of the Monessen, Pa., school board for the past 30 years.

# Industrial Men in the Day's News

## C. F. Hood, C. I. Collins and B. H. Gedge in New Positions with American Steel & Wire Co.

CLIFFORD F. HOOD, manager of the Worcester, Mass., district for the American Steel & Wire Co., has been appointed vice president in charge of operations of the company, with headquarters in Cleveland, succeeding J. L. Perry, who has been transferred to Birmingham, Ala. (STEEL, Jan. 14). Mr. Hood is a graduate of the University of Illinois and from 1915 to 1917 was associated with the Packard Electric Co. He then became an operating clerk at the South works of Steel & Wire at Worcester, leaving shortly thereafter to join the army during the war. Returning in 1919, he was named foreman of the cable works at Worcester, remaining in this capacity until 1925 when he was made assistant superintendent of the South works. From 1928 to 1932 he was assistant manager of the Worcester district, and since 1933 has been manager there.

C. I. COLLINS, superintendent of the Cuyahoga works of Steel & Wire at Cleveland, will go to Worcester as manager of that district. Born in Asheville, N. C., he attended Georgia School of Technology and graduated in mechanical engineering. From 1912 to 1915 he was associated with the Atlanta Steel Co., Atlanta, Ga., and in 1915 became factory superintendent for the United States Cartridge Co., continuing there until 1917. During the war he was active in the army air service and in 1919 joined the sales force of the Hyatt Roller Bearing Co. In 1923 he became assistant general manager for the Morris & Bailey division of Steel & Wire, later becoming general manager. In 1930 he was transferred to the vice president's office in Cleveland and in 1934 was made superintendent of the Cuyahoga works.

B. H. GEDGE, assistant superintendent of the Cuyahoga works, will succeed Mr. Collins as superintendent. He is a graduate in electrical engineering from Purdue university, Lafayette, Ind., and first was employed by American Steel & Wire at the Cuyahoga works in 1911 as electrician. In the period of the next eight years he held various positions in this plant and was placed in charge of rolling operations in 1920. He continued in this capacity until 1924 when he was promoted to superintendent of hot mills. After directing operations in this department for about a year, he was appointed to the post of assistant superintendent of the Cuyahoga works. For approximately the past ten years he has held this position and now, following Mr. Collins' transfer to Worcester, succeeds to the superintendency.

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WILLIAM HARRY JONES, since 1929 associated with Youngstown Sheet & Tube Co., Youngstown, O., has been appointed superintendent of seamless tube mills. During his connection with the company he has acted as assistant superintendent of the finishing department and assistant superintendent of the seamless tube mills. A native of South Wales, he was employed at one time by the British Mannesman Tube Co. In 1907 he came to the United States to work for the Seamless Tubes Co. of America, now known as the Pittsburgh Steel Products Co., at Monessen, Pa. During his 18 years with that company he served as superintendent in various departments of the mills. He left there to go to Jones & Laughlin Steel Corp., where he helped build seamless tube mills at Aliquippa, Pa. Early in 1929 he became assistant superintendent in charge of the finishing department for Sheet & Tube. (Photo Page 24)

Harry Ford, who has been serving as general hot mill foreman at the seamless tube works since 1931, succeeds Mr. Jones as assistant superintendent.

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M. E. Johnson, district sales manager at New York for Pittsburgh Steel Co., Pittsburgh, has been made manager of export sales with headquarters in New York, effective Feb. 1. Associated with Pittsburgh Steel since 1902, he was in the Pittsburgh office in sales executive capacities until 1915. From 1915 to 1924 he was assistant general manager of sales in charge of exports with headquarters in New York, and since 1924 has been district sales manager there. (Photo Page 24)

David F. Mann, district sales manager at Chicago for Pittsburgh Steel has been made district sales manager at New York, succeeding Mr. Johnson. Mr. Mann entered the employ of the company in 1913 as a salesman. In 1917 he was made sales

William Harry Jones

agent in the Pittsburgh office and since 1923 has been manager in Chicago.

Edwin V. Reckley has been appointed district sales manager at Chicago, succeeding Mr. Mann. Mr. Reckley started with the company in 1912 in the advertising department, and from 1918 to 1928 acted in various sales department capacities. From 1928 to 1931 he was assistant manager of the Chicago office and since that time has been sales agent for the Pittsburgh office.

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David P. Williams, vice president of Vulcan Mold & Iron Co., Latrobe, Pa., has been elected a director of the company and will devote most of his time to sales work.

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John A. Robinson, formerly in charge of the Dallas, Tex., office of Timken Roller Bearing Co., Canton, O., has been transferred to the automotive division and appointed district manager of that division with headquarters at the Chicago office.

H. W. Trump has been appointed to the position of district manager of the industrial division with headquarters at Dallas.

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Sylvester A. Mahan has been appointed works manager of the Philadelphia plant of the Edward G. Budd Mfg. Co. Joseph W. Meadowcroft has been named assistant work manager, and Earl Blaine has been appointed chief inspector.

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W. H. Fowler, vice president of Dravo Contracting Co., Neville Island, Pittsburgh, has been elected vice chairman of the heavy construction and railroad contractors division of the Associated General Contractors of America.

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E. L. McNamara, roll salesman in the Youngstown district since 1928 for United Engineering & Foundry Co., Pittsburgh, has assumed his recent promotion as assistant manager of roll and steel castings sales for the United company, with headquarters in Youngstown, O.

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Kurt R. Groener has taken up duties as managing director of the Porcelain Enamel institute, with offices at 612 North Michigan avenue, Chicago. During the past eight years he has been associated with Bennett-Watts-Haywood Co., Chicago, publisher of *Electrical Dealer* and *Electric Light and Power*.

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E. J. Parker, since 1930 manager of Fisher Body Corp. plant No. 1 at Flint, Mich., has been placed in charge of the No. 2 plant as well in a consolidation of the management.

Kurt R. Groener

O. J. Stanitzke, who has been in charge of No. 2 plant, will be transferred to Buffalo to assume the management of the plant in that city when R. N. Wisner, now Buffalo manager, is moved to Baltimore to manage a new Fisher plant to be opened there.

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T. O. Moloney, president of Moloney Electric Co., St. Louis, has been named chairman of the board. J. J. Mullen, vice president, has been advanced to the presidency.

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Charles Wesley Sr. has been elected president and general manager of Wesley Steel Treating Co., Milwaukee, for the twentieth consecutive time. Frank G. Marks has retired as vice president and works manager and is succeeded by Charles

M. E. Johnson

David F. Mann

Edwin V. Reckley

I. Wesley, who was secretary for 20 years. Arthur H. Nuesse has been elected secretary and Joseph F. Husheck has been re-elected treasurer.

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Charles L. Horn has been elected president and chairman of the executive committee of Arrow Head Steel Products Co., Minneapolis. He is also president of the Federal Cartridge Co., Minneapolis.

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Arthur D. Morris, vice president, has been elected president of the Bayonne Bolt Corp., Bayonne, N. J., succeeding E. L. Rupf, who retired to become a mechanical engineering consultant.

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Irving N. Smith has been appointed assistant general sales manager of the Central Iron & Steel Co., Harrisburg, Pa. He has been associated with the company for several years, identified particularly with the floor plate division.

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R. J. Stakelum, formerly assistant district sales manager at Houston, Tex., for Tennessee Coal, Iron & Railroad Co., has been appointed general sales manager of the company at Birmingham, Ala., succeeding R. W. Frawley, resigned.

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William B. Mayo, former chief engineer of the Ford Motor Co., has been made president of the Zonolite Corp. of America and the Zonolite Corp. of Michigan, Detroit. The Michigan company recently started operations at a plant in Detroit to manufacture insulating and acoustic material produced from aluminum-magnesium silicate.

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Arthur B. Mead, president of the newly-organized Philadelphia chapter of the American Steel Warehouse association, has been affiliated with the steel warehouse business since 1912, when he first became associated with Peter A. Frasse & Co. Inc. He is vice president of that company, in charge of the Philadelphia district.

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William L. Hartley, manager of Detroit office of Link-Belt Co., Chicago, has been named manager of foundry equipment sales, with headquarters in Chicago.

Harold L. Hoefman, manager of the company's Indianapolis branch, succeeds Mr. Hartley as manager of the Detroit office.

Richard B. Holmes, of the St. Louis office, succeeds Mr. Hoefman as manager of Indianapolis branch sales.

Carl A. Blomquist, of Chicago, succeeds Mr. Holmes at St. Louis, where he will assist Howard L. Purdon, manager.

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F. R. Wallace, Tabor Mfg. Co., Philadelphia, has been elected president of the Foundry Equipment Manufacturers' association. R. S. Hammond, Whiting Corp., Harvey, Ill., has been chosen vice president.

New members of the board of directors are: B. C. Trueblood, Arcade Mfg. Co., Freeport, Ill.; O. C. Sabin, Steel Blast Abrasives Co., Cleveland; and H. S. Simpson, National Engineering Co., Chicago. The board and officers comprise the code authority for the foundry equipment building industry.

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George Gordon Crawford, former president of Jones & Laughlin Steel Corp., Pittsburgh, has severed his connections with the company to return to his home in Birmingham, Ala. He was president of Jones & Laughlin from February, 1930, to May, 1934, when he was succeeded by Samuel E. Hackett, who had been vice president in charge of sales. From then until the expiration of his five-year contract, Mr. Crawford continued with Jones & Laughlin as a director, a member of the executive committee and in an advisory and consulting capacity.

Mr. Crawford went to Pittsburgh from Birmingham, Ala., where he had been president of Tennessee Coal, Iron & Railroad Co. for 23 years. He succeeded Tom M. Girdler as president of Jones & Laughlin.

# Lake Superior Iron Ore Stocks Heavy, After Season of Light Shipments

FURTHER moderate improvement in Lake Superior iron ore shipments is indicated for this year by official reports of last year's movement and present stocks at mines, lower lake ports and furnaces.

It is probable shipments will not begin until May, as last year, and that first attention will be given to consumers to rounding out supplies as to analyses, waiting for demand to reveal itself as the season progresses.

Ore consumed last year, 22,113,951 tons, was slightly more than that which was shipped, 22,063,824 tons. In 1933 shipments exceeded consumption by 3,500,000 tons. Stocks, however, have not been greatly reduced. On Feb. 1 those at lower ports and furnaces amounted to 32,973,000 tons, 752,000 tons less than Feb. 1, 1934. At the mines, stocks were lowered by about 5 per cent, to approximately 10,000,000 tons.

### Tonnage Is Gaining

The 43.6 per cent increase in pig iron production in January is reflected in ore consumption in that month, 2,152,000 tons, 647,000 tons more than in December, and 451,000 tons higher than in January, 1934.

Assuming that pig iron production is maintained at the January rate through February, March and April, there still will be 24,700,000 tons of ore available May 1 at lower ports and furnaces. Producers consider 20,000,000 tons "normal", and it is probable 15,000,000 tons would be ample.

Last year the market looked good at first; just as it does today. The bulge in ore shipments in the first half was not sustained, however, and the entire year's tonnage was only 1.8 per cent more than in 1933. Final figures as just announced by the Lake Superior Iron Ore association, Cleveland, show for 1934, 22,063,824 tons, compared with 21,672,410 tons in 1933.

### Most Properties Worked

From the beginning of the depression it has been a struggle for the industry to provide work, and hold organizations, and at the same time guard against excessive stocks. Mines and handling equipment have been mechanized to produce and ship 75,000,000 tons annually, whereas they have averaged only 17,700,000 tons in the last four years.

Despite this, the number of mines at which some work has been provided has not varied greatly since 1932. Last year shipments were made from 122 properties. All of these reported some degree of mine operations, except two or three from which shipments were made only from stockpiles.

The Oliver Iron Mining Co., United States Steel Corp. subsidiary, shipped 8,755,248 tons, 40 per cent of the total and close to its usual proportion. Practically all the remaining tonnage was moved by the seven leading independent iron and steel companies and mine affiliates.

The Oliver company picked up 246,587 tons from the yards of the Minnesota Steel Co., Duluth, another Steel corporation subsidiary. Though there is nothing official on this point, the cleaning up of these stocks at

Minnesota Steel may have some bearing on future operation of blast furnaces there.

The Ford Motor Co., went out of the iron ore picture as an operator a year ago, but the North Range Mining Co., which took over its model Blueberry mine on the Marquette range, shipped 253,267 tons last year, compared with 55,152 tons in 1933.

The $5,000,000 magnetic iron ore concentrating plant on the Mesabi range, property of the Mesabi Iron Co., remained idle, while the little experimental plant built at Nashwauk, Minn., by the University of Minnesota's mines experiment station and Butler Bros., (See STEEL Jan. 7, 1935, p. 131) shipped 4652 tons.

All of the gains in range tonnages last year were made in Minnesota. The Mesabi's increased 8.7 per cent; Vermillion, 6 per cent. The Cuyuna range, in Minnesota, reduced its tonnage 28.1 per cent. Other ranges and their reductions: Menominee 11.6 per cent; Marquette 11.9; Gogebic 4.7. Contracts calling for minimum shipments, royalties, taxes, mechanical considerations all were factors causing the relatively heavier shipments from the Mesabi.

The ratio of Lake Superior iron ore consumed in 1934 to the country's output of pig iron showed little change, 1.65 tons of ore to a ton of iron, compared with 1.63 in 1933.

# Lake Superior Iron Ore Shipments in 1934 and 1933

## Mesabi Range

| | 1934 | 1933 |
|---|---|---|
| Adams-Spruce Group | 1,326,272 | 987,610 |
| Agnew | 30,646 | 42,293 |
| Alexandria | 209,802 | 221,187 |
| Bennett | ..... | 44,592 |
| Biwabik | 327,330 | 34 |
| Bruce | 104,409 | 118,037 |
| Burt-Fool-Day | 215,938 | 333,043 |
| Cansiteo | 430,142 | 302,326 |
| Commodore | 56,688 | 53,248 |
| Dale | 46,148 | 17,999 |
| Danube | 194 | ..... |
| Drew | 103,531 | 52,047 |
| Dunwoody | 551,522 | 319,243 |
| Fayal | ..... | 212,881 |
| Genoa-Sparta | ..... | 65,741 |
| Godfrey | 351,112 | 204,146 |
| Halobe | 173,018 | 111,205 |
| Harold | 7,171 | 90,693 |
| Harrison | 106,857 | 151,460 |
| Hartley-Burt-Palmer | 2,000,942 | 2,175,461 |
| Hawkins | 114,716 | 118,573 |
| Hill Annex | 496,804 | 564,398 |
| Hoadley (Crosby) | 23,991 | 143,948 |
| Hull-Rust | 175,154 | 257,648 |
| Kevin | ..... | 23,816 |
| Kinney | 145,206 | 168,568 |
| Langdon | 72,802 | ..... |
| La Rue | 110,490 | 87,736 |
| Leonidas | 285,006 | 532,387 |
| Lincoln | 60,928 | 109,270 |
| Magnetic Concentrates | 1,652 | ..... |
| Mace No. 2 | ..... | 100,515 |
| Mahoning | 857,570 | ..... |
| Mahoning Rust | 75,926 | ..... |
| Malta | 39,727 | 21,638 |
| Margaret | 161,405 | 176,452 |
| Mesabi Chief | 779,441 | 477,845 |
| Minnewas | 555,693 | 505,581 |
| Minorca | 39,918 | ..... |
| Missabe Mt. | 448,800 | 549,306 |
| Mississippi No. 2 | 48,078 | 33,006 |
| Morris | 171,273 | 228,282 |
| Morrison | 575,861 | 588,319 |
| No. Harrison | 61,511 | 125,048 |
| North Uno (N. P.) | ..... | 13,013 |
| Patrick-Ann. | 220,310 | 123,666 |
| St. Paul | 181,621 | 339,549 |
| Sargent | 125,684 | 60,371 |
| Scranton | 282,416 | ..... |
| Sellers | 1,170,416 | 1,082,435 |
| Shenango | 358,789 | 463,438 |
| Sheridan | 1,756 | ..... |
| South Uno (G. N.) | 22,741 | 14,609 |
| South Uno (N. P.) | 35,312 | 28,036 |
| Stevenson | 71,373 | ..... |
| Susquehanna | 302,491 | 225,182 |
| Union | 110,528 | 128,971 |
| Utica Extension | 28,271 | 67,750 |
| Wacootah | 75,956 | 221,388 |
| Webb | 165,572 | 167,738 |
| Wheeling | 74,204 | 154,089 |
| York | 75,985 | 65,802 |
| Total | 14,650,099 | 13,471,625 |

## Menominee Range

| | 1934 | 1933 |
|---|---|---|
| Balkan-Judson | 19,177 | 52,682 |
| Baltic | ..... | 1,827 |
| Bates | 148,078 | 58,473 |
| Bengal | 7,668 | 22,647 |
| Bristol | 162,594 | 50,531 |
| Buck | 10,629 | 53,948 |
| Caspian | 23,404 | 71,231 |
| Chapin | 190,993 | ..... |
| Davidson Group | 50,588 | 139,084 |
| Fogarty | 7,874 | 25,464 |
| Forbes | 19,796 | ..... |
| Genesee | 114,485 | 99,197 |
| Hiawatha | 152,598 | 143,542 |
| Homer | ..... | 84,776 |
| James | 42,061 | 30,457 |
| Loretto | 50,087 | 15,644 |
| Monongahela | 71,885 | 63,289 |
| Odgers | 52,285 | 531 |
| Penn Mines | 59,280 | 385,211 |
| Rogers | ..... | 27,476 |
| Sherwood | ..... | 398 |
| Tobin | 12,903 | 38,258 |
| Virgil | ..... | 48,889 |
| Warner | 115,154 | 97,430 |
| West Chapin | 17,243 | ..... |
| Zimmerman | 6,245 | ..... |
| Total | 1,335,027 | 1,510,985 |

## Marquette Range

| | 1934 | 1933 |
|---|---|---|
| Archibald | 3,750 | 2,264 |
| Athens | 139,021 | 237,283 |
| Blueberry | 253,267 | 55,152 |
| Cambria | 205,301 | 303,739 |
| Cleveland-Cliffs Group | 237,439 | 190,570 |
| Francis | 13,883 | 11,262 |
| Gardiner-Mackinaw | 110,264 | 147,146 |
| Greenwood | 52,394 | 22,096 |
| Imperial | ..... | 54,041 |
| Isabella | 112,254 | 121,127 |
| Lake Superior Holmes | 90,440 | 51,953 |
| Lloyd | 99,023 | 171,917 |
| Maas | 331,413 | 465,893 |
| Morris | 248,824 | 311,468 |
| Negaunee | 149,801 | 476,114 |
| Princeton | 134 | ..... |
| Richmond | 86,067 | 35,408 |
| Stephenson | ..... | 15,900 |
| Tilden | 167,688 | 94,104 |
| Volunteer | 172,884 | 39,888 |
| Total | 2,473,847 | 2,807,325 |

## Gogebic Range

| | 1934 | 1933 |
|---|---|---|
| Anvil | 18,487 | 23,085 |
| Cary | 14,094 | 171,956 |
| Eureka-Asteroid | 234,945 | 189,413 |
| Ironton | 312,710 | 326,219 |
| Keweenaw | 5,270 | 82,126 |
| Montreal | 582,140 | 471,389 |
| Newport | 185,775 | 284,195 |
| Norrie Group | 155,255 | 207,347 |
| Palms | 33,660 | 26,621 |
| Puritan | 281,973 | ..... |
| Sunday Lake | 140,128 | 410,653 |
| Tilden | 46,941 | ..... |
| Townsite | 71,624 | 117,330 |
| Wakefield | 204,129 | 90,598 |
| Total | 2,287,131 | 2,400,932 |

## Cuyuna Range

| | 1934 | 1933 |
|---|---|---|
| Alstead | 14,584 | ..... |
| Armour No. 1 | ..... | 119,443 |
| Armour No. 2 | ..... | 48,325 |
| Croft | 85,640 | 184,580 |
| Evergreen | 92,332 | 55,627 |
| Hillcrest | 45,209 | 307 |
| Ironton | ..... | 12,808 |
| Louise | 17,760 | ..... |
| Maroco | 18,455 | ..... |
| Mahnomen-Hopkins | ..... | 5,455 |
| Martin | ..... | 18,334 |
| Milford | ..... | 50,005 |
| Portsmouth | 81,244 | 86,862 |

## Vermillion Range

| | 1934 | 1933 |
|---|---|---|
| Sagamore | 106,766 | 115,955 |
| Wearne | 70,581 | 43,438 |
| Total | 532,571 | 741,139 |
| Pioneer | 430,116 | 370,030 |
| Sibley | 140,393 | 153,638 |
| Soudan | 113,685 | 61,434 |
| Zenith | 100,955 | 155,302 |
| Total | 785,149 | 740,404 |

GRAND TOTAL ..... 22,063,824 21,672,410

# EDITORIAL

## "Open House" Helps Public To Understand Industry

FOR an industrial company to hold "open house" to permit the public to witness the work and equipment in its plants is not a new idea. From time to time the managements of hundreds of establishments have provided opportunities for plant visitation.

In many of these cases, the invitations were issued to members of engineering societies, to groups of students, or to customers or others whose interest in the plants' operation was direct and tangible. In other instances, and much less frequently, the gates have been opened to the general public. On only rare occasions have company officials invited the members of employes' families to visit their plants.

In view of this apparent apathy of industrial executives generally to the subject of plant visitation by employes' families and the public, the recent experience of the Allis-Chalmers Mfg. Co. is both enlightening and suggestive. As reported on page 14 of the Jan. 28 issue of STEEL, the company on Saturday, Jan. 19, observed "open house." It invited its employes to bring their families and their friends, and about 7700 invitations were sent to industrial and civic leaders, engineering societies, luncheon clubs, colleges, schools, customers and friends.

### Company Attempted to Dramatize Exhibits To Show Significance To Public

The morning was devoted primarily to the inspection of the plants and their work by the members of employes' families. Most of the other invited quests went through the establishment in the afternoon. The company had gone to special pains to make the exhibits attractive. A definite routing had been arranged. Guides were stationed at strategic points. Signs directed attention to features of special interest regarding work and equipment. Broadcasting stations with loud speakers enabled spokesmen for the company to explain the significance of certain exhibits and to describe pertinent phases of company and employe activities.

In short, every reasonable effort was made to dramatize the work of the company, first, in terms of what it means to the community in employment, payment of taxes, etc., and secondly, in terms of how the products of the company contribute daily to the health, comfort and well being of millions of people, not only in the United States, but in many foreign countries.

The result of this experiment was amazing. In spite of inclement weather, a crowd, estimated conservatively at 35,000 persons, passed through the gates, examining the hundreds of exhibits with genuine interest. In point of attendance and of the marked attention paid by the visitors to what they saw, the "open house" celebration far exceeded the expectations of the officers of the company.

In our opinion, the unusual success of this affair was due to several important factors. One was the intelligence of the management in sensing the good psychological effect of affording an opportunity to the dependents of employes to see where the provider of the family works and to examine the products of his labor. Second was the apparent care with which the affair was planned. Third, and probably most important, was the auspicious timing of the event.

### "Open House" Idea Helps To Counteract Flood of Anti-Industry Propaganda

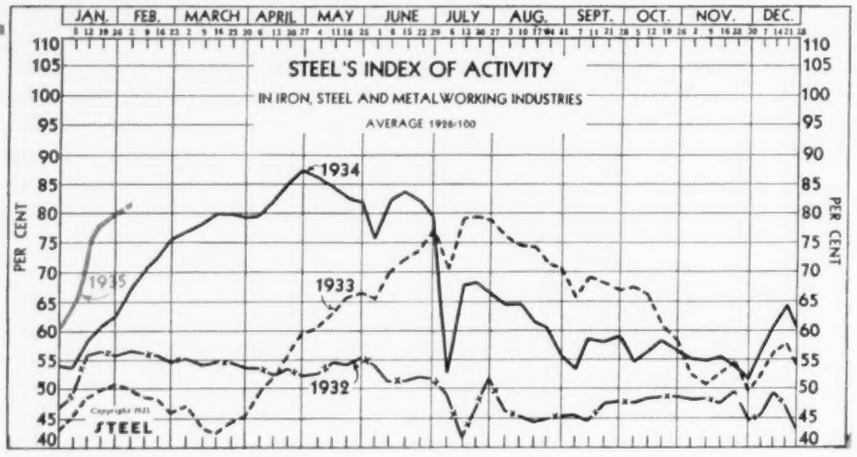
It is almost impossible to emphasize this last point too strongly. For almost two years, much of what has been said or written about industry for public consumption has been defamatory. From persons in high public office, from the headlines of opportunist newspapers, from many pulpits and from the rostrums of numerous educational institutions has flowed an unending stream of vituperation against American industrial establishments. Probably never before in the history of this republic have demagogues felt as free to point to industry as the scapegoat for all that is wrong as they have in the last few years.

One effective way to offset this malicious propaganda is to help employes and the public to understand industry better. It is difficult to think of any means of accomplishing this which is simpler or more effective than the "open house" idea, as carried out so successfully by the Allis-Chalmers organization.

It has the great advantage of demonstrating, unobtrusively but convincingly, the strong bond which exists between the prosperity of industry and the well being of the average citizen.

We believe that the holding of more "open houses" in industry will help appreciably in dissipating public misunderstanding.

# THE BUSINESS TREND




STEEL's *index of activity in the iron, steel and metalworking industries gained 2.4 points to 81.9 in the week ending Feb. 2:*

| Week ending | 1934 | 1933 | 1932 | 1931 |
|---|---|---|---|---|
| Dec. 8 | 56.8 | 52.6 | 46.6 | 52.9 |
| Dec. 15 | 60.6 | 56.0 | 49.3 | 53.1 |
| Dec. 22 | 64.4 | 58.0 | 46.9 | 52.3 |
| Dec. 29 | 60.8 | 53.7 | 42.9 | 46.8 |
| | 1935 | 1934 | 1933 | 1932 |
| Jan. 5 | 65.4 | 53.6 | 45.3 | 48.8 |
| Jan. 12 | 73.8 | 58.1 | 48.6 | 55.8 |
| Jan. 19 | 78.1 | 60.9 | 49.8 | 56.2 |
| Jan. 26 | 79.5† | 62.3 | 50.8 | 55.8 |
| Feb. 2 | 81.9* | 66.9 | 49.9 | 56.2 |

†Revised. *Preliminay.

## Business Gains Assuming More Moderate Pace

INDUSTRIAL activity still is expanding, but at a more moderate, and perhaps a more wholesome, pace than was maintained throughout most of January. STEEL's index of activity for the week ending Feb. 2 stood at 81.9, a gain of 2.4 points from the previous week.

Aside from a continuation of the steady increase in the rates of steelworks operations and motor car assemblies, the principal factor in the rise of the index was a rather sharp upturn in freight car loadings. Revenue freight volume, which slumped off slightly in the week ending Jan. 26, rebounded in the week ending Feb. 2 to a point, indicated by the returns from the principal carriers, slightly in excess of 600,000 cars. This represents a gain from the previous week of nearly 8 per cent. Part of this unusual increase can be attributed to the movement of freight held back by storms in the previous week; the remainder may be considered a reflection of the expansion of general business activity. Electric power output was down slightly from the previous week, but retained a large lead over the output for the comparable week of 1934.

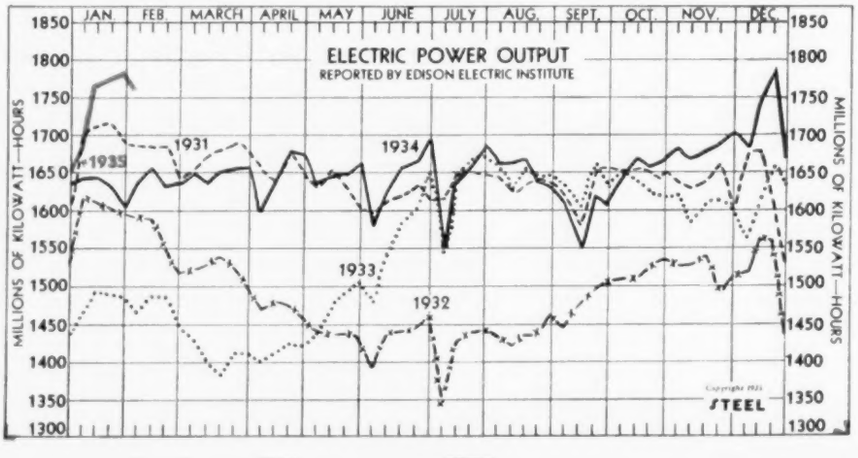
### Effect of Wait for Gold Clause Decision Is Reflected Only Slightly in Industrial Activity

It is significant that the improvement of recent weeks has persisted in the face of certain disquieting developments, which, under conditions prevailing in 1932 and 1933, would have provoked fear and probably slowed the pace of business. That the dampening effect of the pending decision on the gold clause has been felt principally in the stock market and to only a limited extent in industry is an evidence of a marked improvement in morale.

The outcome of the most recent phase of the labor situation, in which A. F. of L. felt the heavy hand of the government administration, will be watched with interest as a factor in the business outlook.

**Million Kw.-Hours**

| 1935 | |
|---|---|
| Feb. 2 | 1,762 |
| Jan. 26 | 1,781 |
| Jan. 19 | 1,778 |
| Jan. 12 | 1,772 |
| Jan. 5 | 1,668 |
| **1934** | |
| Dec. 29 | 1,650 |
| Dec. 22 | 1,787 |
| Dec. 15 | 1,767 |
| Dec. 8 | 1,748 |
| Dec. 1 | 1,683 |
| Nov. 24 | 1,705 |
| Nov. 17 | 1,691 |
| Nov. 10 | 1,675 |
| Nov. 3 | 1,669 |




**Million Kw.-Hours**

| 1934 | |
|---|---|
| Feb. 3 | 1,636 |
| Jan. 27 | 1,610 |
| Jan. 20 | 1,624 |
| Jan. 13 | 1,646 |
| Jan. 6 | 1,563 |
| **1933** | |
| Dec. 30 | 1,539 |
| Dec. 23 | 1,656 |
| Dec. 16 | 1,644 |
| Dec. 9 | 1,619 |
| Dec. 2 | 1,553 |
| Nov. 25 | 1,607 |
| Nov. 18 | 1,617 |
| Nov. 11 | 1,616 |
| Nov. 4 | 1,583 |

## Merchandise Foreign Trade Down in December

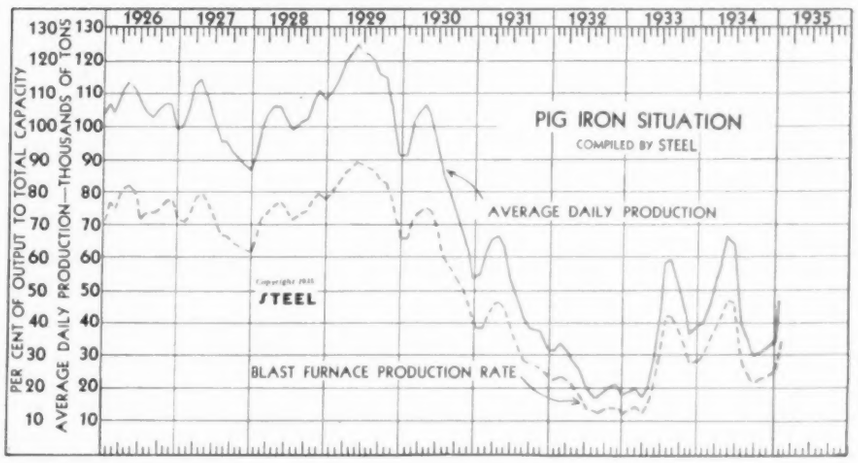
Millions of Dollars

| | 1934 | | 1933 | |
|---|---|---|---|---|
| | Exports | Imports | Exports | Imports |
| Jan. | 169,531 | 128,536 | 120,589 | 96,006 |
| Feb. | 159,671 | 125,292 | 101,515 | 83,748 |
| March | 190,000 | 158,000 | 108,000 | 95,000 |
| April | 176,499 | 141,137 | 105,000 | 88,000 |
| May | 160,207 | 154,647 | 114,000 | 107,000 |
| June | 167,957 | 135,048 | 119,900 | 122,000 |
| July | 161,787 | 127,342 | 144,197 | 142,991 |
| Aug. | 171,965 | 119,515 | 131,000 | 155,000 |
| Sept. | 191,690 | 131,659 | 160,000 | 147,000 |
| Oct. | 203,622 | 137,859 | 194,000 | 151,000 |
| Nov. | 194,909 | 150,919 | 184,000 | 128,000 |
| Dec. | 170,676 | 132,252 | 192,638 | 133,518 |

## Pig Iron Output and Rate Up Sharply

Daily Average

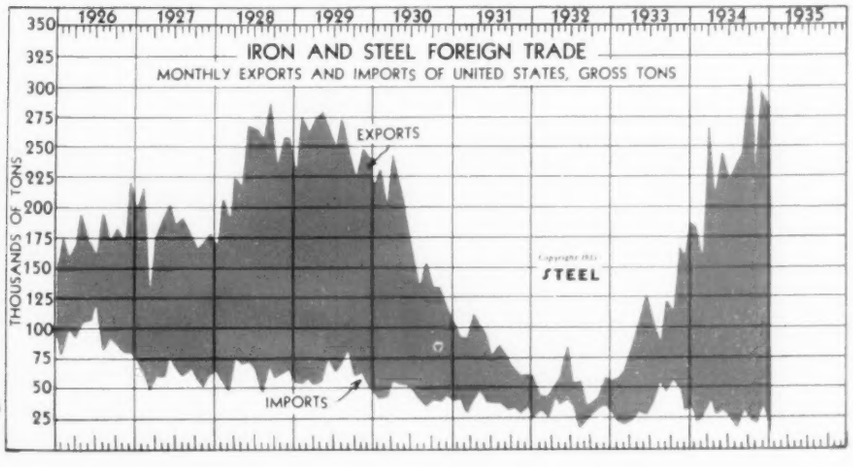
| | 1935 | 1934 |
|---|---|---|
| Jan. | 47,627 | 39,537 |
| Feb. | ..... | 45,385 |
| Mar. | ..... | 52,438 |
| Apr. | ..... | 57,873 |
| May | ..... | 66,370 |
| June | ..... | 64,563 |
| July | ..... | 39,630 |
| Aug. | ..... | 34,199 |
| Sept. | ..... | 29,969 |
| Oct. | ..... | 30,689 |
| Nov. | ..... | 31,930 |
| Dec. | ..... | 33,161 |




Blast Furnace Rate

| | 1935 | 1934 |
|---|---|---|
| Jan. | 34.1 | 28.3 |
| Feb. | ..... | 32.5 |
| Mar. | ..... | 37.5 |
| Apr. | ..... | 41.4 |
| May | ..... | 47.5 |
| June | ..... | 46.3 |
| July | ..... | 28.4 |
| Aug. | ..... | 24.5 |
| Sept. | ..... | 21.5 |
| Oct. | ..... | 22.1 |
| Nov. | ..... | 22.8 |
| Dec. | ..... | 23.7 |

## Steel Export Trade Slumps as Year Ends




Gross Tons

| | 1934 | | 1933 | |
|---|---|---|---|---|
| | Imports | Exports | Imports | Exports |
| Jan. | 22,653 | 178,023 | 21,892 | 56,720 |
| Feb. | 25,407 | 151,184 | 19,748 | 63,936 |
| March | 38,393 | 261,269 | 22,114 | 80,567 |
| April | 26,862 | 201,539 | 28,061 | 100,395 |
| May | 29,465 | 241,753 | 26,295 | 123,069 |
| June | 24,848 | 219,406 | 34,368 | 102,581 |
| July | 17,676 | 233,186 | 52,805 | 83,311 |
| Aug. | 32,418 | 242,947 | 46,839 | 119,374 |
| Sept. | 23,847 | 301,330 | 55,706 | 108,799 |
| Oct. | 20,202 | 220,209 | 46,673 | 164,755 |
| Nov. | 35,272 | 299,263 | 28,979 | 157,600 |
| Dec. | 19,708 | 282,655 | 31,310 | 184,585 |

# Report on Strengthening

BY HARRY B. PULSIFER

Metallurgist, Ferry Cap & Set Screw Co., Cleveland

IN TESTING or specifying the properties of bolts, the presence of threads greatly complicates a simple statement of the quantities involved. It involves the matter of comparing bolt strength with material strength, a simple experiment at first thought, yet however easy the comparison in any one case, there are a good many materials, many conditions of material, many sizes, and many ways of threading.

General information about the properties of materials is largely based on the results obtained by testing standard test bars, 0.505-inch in diameter and 2.25 inches long in the straight 2-inch marked section. But bolts usually are tested simply by putting them in the tensile machine and pulling them apart in the threaded section near the full-sized stem. The results of testing bolts can be given in actual load and elongation for the specific part, or in pounds per square inch. In the latter case the calculation may be based on the root area, the pitch area, or an area figured from the mean between the root and pitch diameters.

The precision of the results is not improved by the practice of measuring only pitch diameters and neglecting the actual root diameter.

### Basis for Calculations

The present status of the whole subject is that the strength of bolts is now based on all three areas—root areas, pitch areas and mean diameter areas. The latter (see sketch on page 31) is the one recommended by the American Society for Metals subcommittee on testing of bolts as published in the 1933 edition of *The National Metals Handbook*. The root area basis has predominated chiefly in the past, and it has a certain irrefutable and logical claim as being approximately the smallest cross-section of the tested piece. Curiously enough, the Navy department uses root areas for nonferrous bolts and pitch areas for steel bolts.

Without doubt, the most practical system in writing specifications is to state the minimum requirements of the actual parts involved. Yet, somehow, this has to be well correlated with the recognized properties of materials as determined from standard test bars. One of the simplest ways to establish the relation between the properties of test bar and bolt is to use bolts long enough to turn root diameter bars out of the stem and thus compare normal bolts with similar ones turned down.

Whatever the diameter of the turned down section, the results for elastic limit, proportional limit, yield point, tensile strength and fracture load might well represent the standard properties of the material; elongation might suffer slight deviations from standard because of departure from the standard proportions as expressed in the law of similitude, or ratio of slenderness.

Determined in this manner, the increased strength of the bolt can well express the effect of the thread spiral, the short length and the close shoulders as the *strengthening effect of threads*. Some preliminary results were contained in a paper entitled "Physical Properties of Fine Bolts," published in *Transactions* of the American Society for Steel Treating, XVIII (1930), p. 273. The eight specific cases mentioned in that paper now have been increased to 50, listed in the table on page 32. Thirteen materials, ten thread sizes and variations of treatment make up the 50 specific comparisons. Bolt sizes are from ¼ to ¾-inch diameter; threads are both coarse and fine; strengths vary from some 45,000 pounds per square inch to well over 200,000 pounds per square inch.

A survey of the tabulated results seems to indicate that the conditions determining the strengthening effect of threads are rather too complex to allow of establishing a rule or formula in order to predict the effect.

The increase in the proportional limit, which is slightly higher than the elastic limit, is found to be in the range from 6 to 66 per cent. The increase in tensile strength ranges from 4 to 44 per cent. The area corresponding to the mean root-pitch diameter increases from 6 to 18 per cent over the root area for the same series of thread sizes.

### Summary of Results

It will be noticed that the strengthening effect is usually much greater on the proportional limit than on the tensile strength, yet it is slightly less in six cases. It is evident that the strengthening effect on the tensile strength is at a minimum in the case of the strongest bolts. The strengthening effect is also low on material of low strength if the bolt has high elongation in the threaded section. Whenever possible, a length of threads equal to the diameter of the bolt was exposed during the tensile test.

Coarse threads strengthen more than fine threads. Bolts that are heat treated after threading have substantially the same thread strengthening effect on the tensile strength whether the threads are cut or rolled. In the case of untreated bolts the strengthening effect depends on the manner of forming the threads and increases in the following sequence:

1. Fine cut threads.
2. Coarse cut threads.
3. Fine threads rolled on milled ends.
4. Coarse threads rolled on milled ends.
5. Fine threads rolled on extruded ends.

# Effects of Bolt Threads

6. Coarse threads rolled on extruded ends.

On all bolt sizes from ¼ to ¾-inch diameter the percentage increase in pitch area over root area is approximately twice the increase in mean root-pitch area over root area. The percentage increase in the full-sized areas over the root areas is some four times the increase of the mean root-pitch area over the root areas.

In the 50 cases reported the strengthening effect of the threads on the tensile strength approximates the increase in mean root-pitch area over root area in 21 cases; it approximates the pitch area increase in some 24 cases, and in five cases the increase is of the same order as the full-sized area is greater than the root area. The strengthening effect is always a positive quantity just as the greater areas are larger than the root areas; otherwise the mean root-pitch area lacks any definite significance.

### The Bolt as a Unit

Cutting threads and milling the end section does not sensibly cold work the underlying metal but extruding the end and rolling the threads intensifies the strengthening effect.

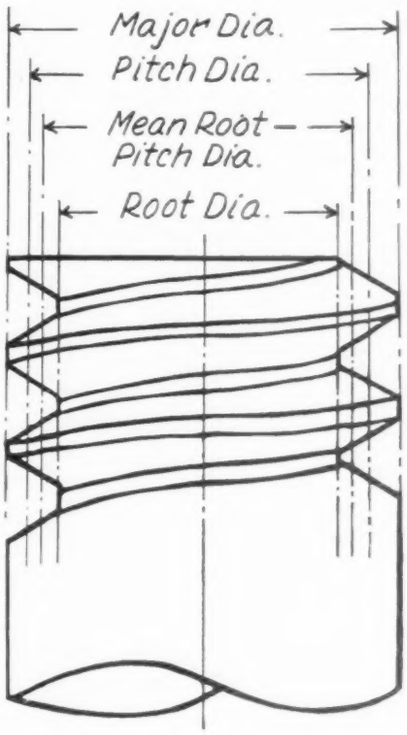
The irregular number of thread crests broken through in bolts with identical properties—and the number may be one or up to nine—inclines one to disregard the significance of the thread sections themselves.

In only one set of the 50 cases did the bolts pull apart in the full-sized stem. This was in the case of a stainless iron, extruded and rolled with fine threads. Such instances might happen more often with bolts of pitch diameter (reduced) stems but no bolts of this sort were used in the investigation.

In this study the strengthening effect of the threads was determined by comparing the properties of ten normal bolts with ten that had 2.25-inch sections of the stem turned down to root diameter. In a few instances the number was less than ten or the section of shorter length.

Many of the details in the manufacture and use of the more common bolts have no significance whatever, yet become of importance when the full properties of a material are called into play in a bolt of the highest qualities.

Thus, a bolt is inherently a tensile member in the assembly of other and more massive parts. To a lesser extent a bolt is useful as a member to resist shear forces. But the threads on a bolt end create a notched-bar member and render it entirely unsuitable to resist bending, impact and fatigue stresses. An especially dangerous design is a bolt with part of the head cut away. This inevitably forces stress concentration under the head and locates a point for tearing across the tensile section. A sharp corner or sharply cut recess under the head also can endanger the end of the bolt that should be most secure.




*Exaggerated sketch of bolt thread, showing various diameters referred to in the text*

The head end is in its most reliable condition when it has a normal shape and generous fillet under the head. The top of the head should be available for hardness testing, preferably the brinell test.

If there is no suitable place for making a brinell test without destroying the bolt (flattening the shank) it is rather certain that only a small number from any one lot will be tested, either during manufacture or before using. Hardness tests that leave a smaller impression can be made but their precise value diminishes with the decrease in area indented.

### Materials and Properties

The sketch on page 33 indicates bolt heads which may be used only by sacrificing substantial value in a normal head. Likewise, the stamping of letters or numerals on the top of a bolt head does not add to uniformity of the metal after heat treatment and can only make more uncertain the hardness test. Most certainly there are good reasons for the designs and carvings of a bolt-head but they should be weighed against ensuing deficiencies.

As to the matter of coarse or fine threads, it is obvious that a fine-threaded bolt has a larger root section and will utilize material and space more effectively. But the finer the threads the closer must be the size tolerances and the better the fit of the nut. Common steel nuts are suitable for common bolts and should break the bolt in the threaded section when the assembly is put to the tensile test. But high tensile bolts require heat treated nuts and snug fits to prevent stripping the threads from the nut.

The materials of which bolts are made comprise the straight carbon

steels, many alloy steels, the three common stainless alloys, copper and brass and several bronzes, and nickel and its copper alloy, monel metal.

The low-carbon steels, containing from 0.08 to 0.25 per cent carbon constitute a group of materials from which most common bolts are made. In this class are the cold finished bars of bessemer and basic screw stock S. A. E. 1112 and 1120, bars and wires of S. A. E. 1010, 1015 and 1020, with others of still different carbon ranges. To provide bolts of higher tensile strength the carbon content may be raised as needed, even to around 0.40 per cent. Heat treated carbon steel bolts commonly are made of steel with around 0.35 per cent carbon, that is, S. A. E. 1035.

In the alloy ranges the chromium, nickel-chromium, nickel or chrome-molybdenum steels are the most popular materials. Any of these will make bolts of excellent quality. Their carbon ranges are indicated by the S. A. E. numbers such as 5140, 3135, 2330, 4140 and 3240. There is little advantage in using an alloy steel unless a tensile strength of over 150,000 pounds per square inch is needed.

In the still higher carbon ranges and without other alloying than with manganese, the straight carbon steels merge into the spring steels with their well-known excellent properties. There may, indeed, be a gain in toughness but not in stiffness, for the modulus of elasticity is the same for all steels and an alloy steel will stretch as much as a carbon steel, each up to its elastic limit.

Among the nonferrous alloys the newer silicon-copper bronze alloys and nickel-aluminum bronze are practical materials with strength and corrosion resistance. Monel metal has its own recognized properties; brass is in common use; nickel, copper, and nickel-silver have minor but particular uses.

In outlining the properties most desired in bolts, it should be remembered that they must be tough and at least slightly ductile in the threaded section. When the shanks are long enough, any of the materials mentioned easily will bend cold through 180 degrees around a pin of their own diameter.

Yet bolts have been known to fail in service largely on account of the notch effect in the threaded end. This is so disturbing to the users that strength is often sacrificed for abundant ductility. A mere approach toward brittleness so easily endangers a threaded

# Strengthening Effect of Threads

**Nonferrous and Chrome Irons**

| Material and treatment | Size, inch | Thread | Brinell, head | Brinell, stem | Proportional limit, bolt root (lbs. per sq. in.) | Tensile strength, bolt root (lbs. per sq. in.) | Elongation in 2 inches, bolt, per cent | Increase, Per Cent: Proportional limit | Increase, Per Cent: Tensile strength | Increase, Per Cent: Mean dia. area | Increase, Per Cent: Elongation by turning down |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Duronze, ½ hard | ¾ | Coarse rolled | 187 | 158 | 103,800 | 117,700 | 3.1 | 47.9 | 19.3 | 14.3 | 330 |
| Brass, annealed | ¾ | Coarse rolled | 162 | 77 | 43,900 | 66,500 | 10.2 | 30.5 | 24.6 | 14.3 | 392 |
| Olympic bronze, ½ hard | ¾ | Coarse rolled | 198 | 156 | 76,200 | 119,800 | 5.8 | 52.0 | 43.7 | 14.3 | 210 |
| Ni-Al Bronze, ½ hard | ¾ | Coarse rolled | 206 | 166 | 108,600 | 126,700 | 2.7 | 45.7 | 29.6 | 14.3 | 211 |
| Monel, annealed | ⅝ | Coarse rolled | 235 | 114 | 60,300 | 101,200 | 18.0 | 56.2 | 29.3 | 14.3 | 137 |
| Enduro AA, annealed | ⅝ | Fine rolled | 220 | 134 | 49,100 | 90,700 | 28.4 | 33+ | 33+ | 8.6 | * |
| 18% chrome-iron annealed | 1 | Coarse cut | 228 | 187 | 92,200 | 101,300 | 7.7 | 42.8 | 19.2 | 13.8 | 103 |
| **Low Carbon Bolts** | | | | | | | | | | | |
| 0.09 carbon, untreated | ½ | Fine cut | 173 | 126 | 70,700 | 76,100 | 8.9 | 25.1 | 17.1 | 7.5 | 92 |
| 0.09 carbon, untreated | ½ | Coarse cut | 170 | 126 | 72,600 | 78,500 | 8.9 | 31.0 | 19.0 | 12.8 | 84 |
| 0.09 carbon, untreated | ½ | Fine rolled | 166 | 126 | 75,600 | 81,200 | 8.9 | 27.5 | 23.9 | 7.5 | 93 |
| 0.09 carbon, untreated | ½ | Coarse rolled | 174 | 126 | 84,100 | 86,800 | 5.9 | 31.1 | 30.9 | 12.8 | 170 |
| 0.09 carbon, quenched | ½ | Fine cut | 157 | | 62,100 | 87,400 | 13.1 | 24.3 | 13.2 | 7.5 | 47 |
| 0.09 carbon, quenched | ½ | Coarse cut | 159 | | 65,700 | 91,500 | 10.3 | 34.9 | 19.3 | 12.8 | 103 |
| 0.09 carbon, annealed | ½ | Fine cut | 95 | | 29,100 | 50,400 | 14.8 | 36.2 | 17.0 | 7.5 | 205 |
| 0.09 carbon, annealed | ½ | Coarse cut | 95 | | 24,400 | 53,100 | 12.0 | 55.1 | 24.1 | 12.8 | 261 |
| 0.10 carbon, quenched | ¼ | Coarse cut | 170 | | 80,600 | 90,900 | 4.6 | 23.4 | 21.4 | 18.1 | 74 |
| 0.10 carbon, quenched | ½ | Fine | 198 | | 73,000 | 107,900 | 9.4 | 23.0 | 23.9 | 15.5 | 65 |
| 0.10 carbon, quenched | ¾ | Coarse | 160 | | 70,300 | 94,400 | 14.1 | 11.8 | 10.6 | 10.7 | 67 |
| S.A.E. 3115, untreated | ¼ | Coarse cut | 225 | 179 | 88,300 | 102,760 | 7.8 | 20.1 | 12.0 | 13.8 | 132 |
| **High Carbon Bolts** | | | | | | | | | | | |
| 0.37 carbon, untreated | ½ | Fine cut | 222 | 179 | 97,200 | 104,000 | 2.6 | 34.6 | 20.1 | 7.5 | 485 |
| 0.37 carbon, untreated | ½ | Coarse cut | 217 | 179 | 95,200 | 102,900 | 2.5 | 43.7 | 16.7 | 12.8 | 564 |
| 0.37 carbon, untreated | ½ | Fine rolled | 217 | 179 | 88,100 | 109,100 | 4.9 | 30.1 | 24.3 | 7.5 | 282 |
| 0.37 carbon, untreated | ½ | Coarse rolled | 217 | 179 | 104,500 | 120,900 | 3.4 | 56.8 | 39.8 | 12.8 | 397 |
| 0.37 carbon, treated | ½ | Fine cut | 321 | | 164,000 | 179,900 | 3.6 | 13.5 | 11.7 | 7.5 | 292 |
| 0.37 carbon, treated | ½ | Coarse cut | 321 | | 166,800 | 186,500 | 2.8 | 15.8 | 16.4 | 12.8 | 368 |
| 0.37 carbon, annealed | ½ | Fine | 136 | | 42,200 | 76,900 | 15.5 | 8.3 | 9.0 | 7.5 | 123 |
| 0.37 carbon, annealed | ½ | Coarse | 137 | | 43,800 | 79,300 | 9.7 | 16.2 | 16.6 | 12.8 | 241 |
| 0.36 carbon, untreated | ¼ | Coarse rolled | 217 | 170 | 96,200 | 112,500 | 3.3 | 59.1 | 31.8 | 15.5 | 191 |
| 0.62 carbon, treated | ¾ | Fine | 364 | | 181,100 | 196,500 | 1.3 | 11.3 | 6.9 | 8.6 | 350 |
| 0.41 carbon, treated | ½ | Coarse | 238 | | 101,300 | 125,300 | 5.3 | 26.6 | 16.3 | 12.8 | 240 |
| 0.38 carbon, treated | ⅝ | Fine | 252 | | 112,400 | 133,700 | 11.9 | 18.5 | 14.2 | 6.6 | 350 |
| **Untreated Alloy Bolts** | | | | | | | | | | | |
| S.A.E. 2330 | ½ | Fine cut | 237 | 207 | 88,600 | 111,300 | 5.0 | 23.0 | 15.3 | 7.5 | 268 |
| S.A.E. 2330 | ½ | Coarse cut | 241 | 207 | 81,900 | 115,000 | 3.0 | 27.6 | 19.2 | 12.8 | 513 |
| S.A.E. 2330 | ½ | Fine rolled | 238 | 207 | 100,400 | 121,800 | 6.1 | 39.4 | 26.2 | 7.5 | 201 |
| S.A.E. 2330 | ½ | Coarse rolled | 248 | 207 | 108,800 | 131,300 | 2.9 | 51.1 | 36.1 | 12.8 | 534 |
| S.A.E. 3135 | ½ | Fine cut | 255 | 207 | 91,700 | 117,100 | 5.3 | 24.9 | 15.3 | 7.5 | 289 |
| S.A.E. 3135 | ½ | Coarse cut | 255 | 207 | 104,500 | 121,900 | 4.1 | 42.3 | 21.1 | 12.8 | 402 |
| S.A.E. 3135 | ½ | Fine rolled | 255 | 207 | 99,600 | 127,500 | 7.9 | 33.9 | 25.9 | 7.5 | 163 |
| S.A.E. 3135 | ½ | Coarse rolled | 255 | 207 | 120,800 | 138,400 | 4.2 | 66.7 | 35.9 | 12.8 | 381 |
| **Heat Treated Alloy Bolts** | | | | | | | | | | | |
| S.A.E. 3135 | ½ | Fine | 295 | | 140,100 | 156,000 | 9.4 | 6.2 | 5.9 | 7.5 | 83 |
| S.A.E. 3135 | ½ | Fine | 364 | | 198,300 | 205,680 | 1.7 | 19.1 | 12.0 | 12.8 | 635 |
| S.A.E. 3135 | ½ | Coarse | 364 | | 195,200 | 202,500 | 2.8 | 16.0 | 10.1 | 7.5 | 186 |
| S.A.E. 2330 | ⅝ | Fine | 241 | | 110,500 | 139,600 | 8.3 | 25.8 | 21.3 | 8.6 | 137 |
| S.A.E. 2330 | ½ | Coarse | 306 | | 158,700 | 169,100 | 5.7 | 15.2 | 14.4 | 12.8 | 179 |
| S.A.E. 2330 | ½ | Fine | 306 | | 143,800 | 161,500 | 9.2 | 6.2 | 6.2 | 7.5 | 88 |
| S.A.E. 2330 | ⅝ | Fine | 364 | | 201,700 | 212,600 | 6.3 | 23.8 | 18.7 | 6.6 | 140 |
| S.A.E. 2330 | ½ | Coarse | 430 | | 216,100 | 246,900 | 1.7 | 19.7 | 9.9 | 12.8 | 588 |
| S.A.E. 2330 | ½ | Fine | 430 | | 215,400 | 234,100 | 3.3 | 16.1 | 4.1 | 7.5 | 264 |
| S.A.E. 2350 | ¼ | Fine | 340 | | 156,200 | 172,400 | 2.2 | 18.2 | 13.0 | 7.1 | 560 |
| S.A.E. 2350 | ⅝ | Fine | 342 | | 166,800 | 181,300 | 2.4 | 19.7 | 12.8 | 6.6 | 546 |

*Failed in full stem section, full strengthening unknown.

end when subjected to bending, impact or fatigue that the full strength of a material never is developed. This is doubtless the reason why alloy bolts often are used in a tough, instead of really strong, condition. It may *not* be possible to guard against bending, impact or fatigue, but tough materials *can* be provided.

The low-carbon materials consist of ferrite and pearlite, to use the metallographic terms for their microconstituents. When fully annealed, such stock has a brinell hardness around 100 and a tensile strength between 40,000 and 50,000 pounds per square inch. It is highly ductile and even a threaded section stretches abundantly. When made into bolts from either hot-rolled rods, cold-drawn bars or bright-drawn wire the hardness and strength are increased and the ductility diminished. Strength has been imparted with only a moderate sacrifice of ductility; there should remain enough for all practical needs.

Low-carbon steel makes the practical material for the ordinary assemblies of common equipment. It is the stock for a large category of bolts and related parts that include scores of special designs and usages. For moderately enhanced strength the engineer has only to impart a little more cold working or provide a little higher carbon content. It is not advisable to make bolts with much above 90,000 pounds per square inch strength from low-carbon stock, lest brittleness become noticeable.

### Meeting Specifications

One of the common requirements for government bolts is for a material that has a yield point of at least 30,000 pounds per square inch, a tensile strength of at least 58,000 pounds per square inch, and elongation of 26 per cent in 12 times the diameter for small sizes or in 8 inches for sizes greater than ½-inch diameter. Steel with around 0.25 per cent carbon content meets this requirement easily when it is slightly annealed; it is also met by all higher carbon contents up to 1 per cent when the stock is properly annealed, that is, more or less spheroidized.

A steel with some 0.35 per cent carcarbon provides a material with a remarkably wide range of properties in sections of less than 1 inch in thickness. In this and all the other steels for bolt manufacture the properties are dependent on the condition of ferrite and carbide, whether the carbide is in lamellae in pearlitic areas or in dispersed spherulites. The heat treatment is merely the manner of ordering this internal microstructure.

In the spheroidized stock, the soft ferrite matrix is impregnated with minute globules of carbide. In the pearlitic stock there is the same ferrite and the pearlitic complex of laminated carbide and ferrite. In normalized stock there is ferrite and pearlite tending toward the even finer complex known as sorbite. In the quenched and drawn material pearlite is avoided but the carbide droplets can exist over an enormous range of dispersion according to the extent of the drawing. The finest dispersion of the carbide makes the hard and brittle troostite, the coarsest makes the soft and ductile spheroidized stock. Cold working can modify any of these heat-produced properties. Little wonder that S. A. E. 1035 is a widely used and favorite material for bolts.

Alloy steels are merely materials which have the carbon dispersion enhanced by the presence of the alloying elements. Their structures parallel those of the straight carbon series but always with finer carbide dispersion, greater strength and slightly, if any, lower ductility.

A 0.35 per cent carbon steel may be quenched and drawn to brinell 321, when it will have a proportional limit of 144,000 pounds per square inch, tensile of 160,000 pounds per square inch, and 12.5 per cent elongation in 2 inches. Yet a 3.5 per cent nickel steel of the same carbon content may have this same elongation at brinell 430 and with a proportional limit of 180,000 pounds per square inch and tensile of 225,000 pounds per square inch.

It is interesting to note that, in the annealed condition, the S. A. E. 3135 or 2330 steels easily meet the government requirement for a steel of yield point of 40,000 pounds per quare inch, tensile of 75,000 pounds per square inch and 21 per cent elongation in 12 times the diameter for small sizes and in 8 inches for over ½-inch diameters. The carbon steels can meet these requiremnts but are not as easily adjusted.

In the field of nonferrous metals the copper alloys containing silicon and a third metal have taken the foremost place in recent years. Although their base metal, copper, is inherently softer and weaker than pure iron, the abundant toughness after cold working enables them to be strengthened considerably before brittleness becomes significant.

These copper alloys, with monel metal and the stainless alloys of iron with chromium, or iron with chromium and nickel, are strictly solid solution alloys with a single component, microscopically. They have high workability, good strength, corrosion resistance and pleasing appearance. The only drawback to more extensive utilization is their higher cost.

Brass is inferior in physical properties but its brilliant color and established place in industry keeps it always in use. Of course it is one of the easiest alloys to make into bolts by any of the manufacturing processes.

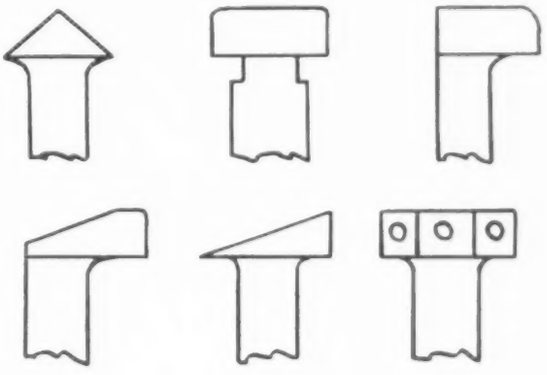
It is characteristic of the solid solution alloys that they are softer and more easily extensible than the steels. In terms of tensile machine results, their elastic limits are low. The strengthening effect of threads may be high when they are rolled on and so cold work the metal even below the root of the thread. With no second component in the metal to disperse, it is impossible appreciably to harden any of these alloys by heat treatments.

The nickel-aluminum bronze tested for this study contained a fine precipitate, known as the *delta* component. This fine dispersion of a hard component is probably the source of its high qualities.

It is pertinent to consider the new copper-beryllium and the nickel-beryllium alloys which can be quenched and age hardened to a remarkable extent. While these attain a brinell hardness of 400, more or less, none of the published tests indicates much ductility at this hardness. The carbon and alloy steels, at comparable hardness, have four or five times as much ductility and would be correspondingly more suitable for bolts.

The tables show the low ratio of elastic limit to tensile strength in the solid solution alloys and the high strengthening effect of the threads. But the elongations, even in the threaded sections, are good. It is fortunate that this toughness is one of the most desirable qualities in bolts.

The shear strength was determined on each lot of bolts ex-



*ODD-SHAPED bolt heads which may be used only by sacrificing a substantial amount of some quality needed in a normal type of head*

amined for the strengthening effect of the threads. This quality of material varies somewhat between the materials and the treatments of any one material. It is highest, relative to the tensile strength, in the softer condition of any steel. It averages higher in the nonferrous materials than in the steels. In most of the steels the proportional limit and maximum strength in single shear is between 65 and 70 per cent of the proportional limit and tensile strength, respectively, of the materials. In the bronzes, stainless alloys and soft steels, the shear ratios may be even as high as 75 to 85 per cent of the tensile figures.

The higher ratios of the softer materials are accounted for easily by examining the sheared sections. It is impossible to prevent some metal flow in the highly ductile alloys while the stiffer steels are cut across by the shearing edges with a minimum of metal flow.

In estimating the shear strengths from the tables it must be kept in mind that the tables giving bolt strength use quantities based on root areas and so include the strengthening effect of the threads. The material strength is less than the bolt strength by the amount of strengthening effect.

**Strengthening Effect of Threads**

While the tables give in some detail the exact strengthening effect of the threads in each particular case, the necessary abridgement of the results leaves much valuable information excluded.

All the figures are averages of closely agreeing determinations and usually of lots of ten each. Always the comparisons are on pieces from the same coil of wire that have had identical treatment, except in the turning down of the stems. The 50 comparison cases requiring 500 normal bolts against 500 turned down comparison pieces; actually, only 450 turned down pieces are against the 500 normal bolts, although in the incomplete instances at least three pieces have been used.

All the material originally was in wire form and all heads were cold-upset. This accounts for the separate and different brinells in the case of untreated bolts.

Thirty of the comparisons came from four coils of wire, one each of S. A. E. 1010, 1035, 3135 and 2330 steel. The different treatments and thread sizes account for the large number of comparisons.

For uniform results in pulling bolts, the same length of thread must be exposed outside of the grips, or nuts, in each set. This length was the diameter of the bolt in nearly all cases and whenever possible. The closer the grip is to the shoulder of the stem, the higher the tensile results and the less the elongation, as a rule. The stretch in the threaded section, divided by 2 (inches), is the elongation in 2 inches as given in the tables.

Since space prevents giving more than the bolt strength as figured from root areas, the strengthening effect on the proportional limit and the tensile strength is expressed as a percentage increase over the determinations on the material, that is, the turned down stems. The material properties are thus quickly determinable from the tables.

The indicated percentage increase in the elongation found on the turned down pieces, often from 100 to 500 per cent, is a forceful reminder of how the threads have strengthened the bolt and reduced its ductility and reduction of area.

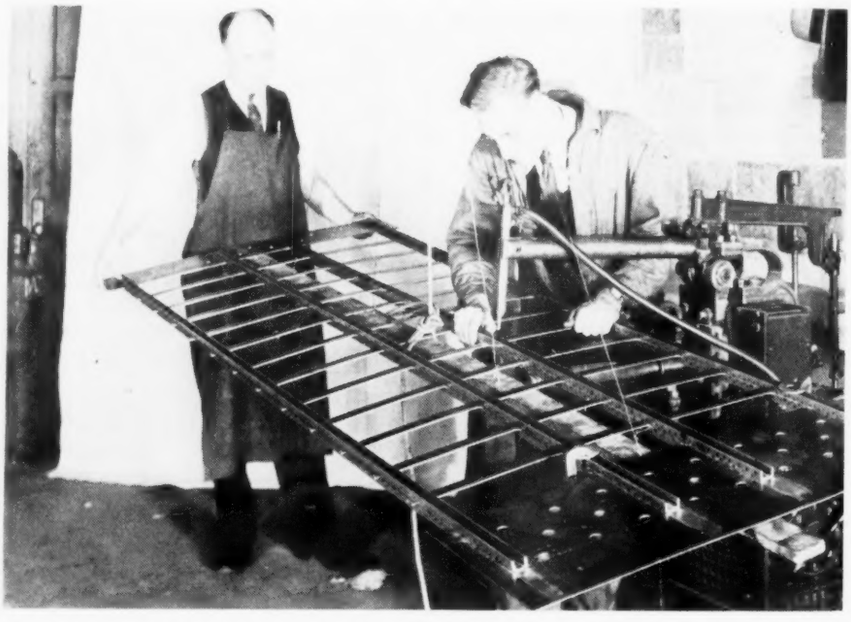
The column giving the increase of the mean root-pitch area over the root area is included since there seems to be some opinion that the strengthening effect of threads is equivalent to just this increased area.

With the generally far greater increase of the proportional limit than of the tensile strength, and the wide spread in both quantities, the value of the mean area may fairly be open to question. Its use is unquestionably a step in the right direction; but whether the step is worth the taking, and will be used generally, must be left for future determination.

## Beryllium Copper Clips Resist High Temperatures

For making the connection on tungsten rods of rectifier bulbs used in rectifying electrical current for motion picture projectors, the Fahnestock Electric Co., Long Island City, N. Y., uses clips made from beryllium copper supplied by Riverside Metal Co., Riverside, N. J. The company states that whereas clips of other materials gradually lost their spring, with resultant arcing, the beryllium copper clips withstand the temperatures in excess of 400 degrees Fahr. which are developed in high amperage rectifiers. Some of them have been in use for more than a year with no loss in spring properties.

## Steel Wind Stress Model



*LOWER 13 STORIES OF 55-STORY 3-PANEL WIND BENT DESIGNED BY H. V. SPURR: Made by spot welding, 1/24 actual size, members represent H-columns up to 14 inches and girders up to 26 inches. Allowance is made for amount that each story will be pushed to one side by the wind, and girders are selected of such size that when they and the columns bend under wind stress the reverse curvature will come at their mid-points. In tests conducted at the engineering experiment station, Ohio state university, Columbus, O., and the subject of a report by Clyde T. Morris, George E. Large and Samuel T. Carpenter at the meeting of the American Institute of Steel Construction last October, measurements of loads and deflections verified the design as far as regular and symmetrical bents are concerned. The upper 42 stories of the building frame were represented by a specially designed frame on which wind load could be applied. For the tests the bent and frame were laid on ball bearings on a table and the "wind" applied—315 pounds of weights on the frame and 7.5 pounds at each of the lower stories*

# Service Characteristics Of the Light Metals And Their Alloys

BECAUSE of widespread interest in the light metals and their alloys, STEEL has arranged with the American Society for Testing Materials to present in several articles major portions of its recent report "Service Characteristics of the Light Metals and Their Alloys" prepared by subcommittee VII of committee B-7 on light metals and alloys, cast and wrought. The report, the culmination of two years' work, embraces information on metallurgical characteristics, industrial requirements, surface protection, and tabular data. Alloys listed represent only those believed to be the more important—certainly not all of the commercial alloys now in use. Personnel of subcommittee VII includes E. H. Dix Jr., Aluminum Co. of America, New Kensington, Pa., chairman; A. L. Boegehold, General Motors Corp., Detroit; D. L. Colwell, Stewart Die Casting Corp., Chicago; J. A. Gann, Dow Chemical Co., Midland, Mich.; J. B. Johnson, United States army air corps, Dayton, O., exofficio; H. S. Rawdon, National bureau of standards, Washington; and Sam Tour, Lucius Pitkin Inc., New York. The American Foundrymen's association co-operated through its representative, T. D. Stay, Aluminum Co. of America, Cleveland. J. J. Bowman, associate of the chairman, compiled and edited the report.

## Part I

ALUMINUM is a metal of low density which crystallizes in the cubic system. The grade usually used contains 99.0 per cent aluminum, although the metal is commercially available with a purity of 99.5 per cent and has been prepared with an aluminum content of 99.99 per cent; silicon and iron are the chief impurities in virgin metal. The physical properties of the pure metal are given in Table III.

Ingot aluminum is purchased on the basis of minimum aluminum content, although the federal specifications board has adopted more rigorous specifications. Several grades are shown in Table VI. Ingots are notched and may be procured in 1 to 50-pound sizes. Alloy ingots are differentiated by form, size and marking.

### Principal Alloying Elements

Aluminum alloys readily with many elements; bismuth, lead and cadmium being notable exceptions. The principal elements used for manufacturing commercial alloys are copper, silicon, iron, manganese, magnesium, zinc, chromium, titanium and nickel. Most of these elements have a profound effect on the properties of pure aluminum. The chemical compositions of the common alloys used for castings are given in Table I and for wrought alloys in Table II.

Aluminum alloys may be cast in green or dry sand, permanent molds, or in the form of pressure die castings. Certain of the alloys used for sand casting also are used for castings produced by the other processes while others have been developed for their specific process. The choice of alloy, as well as process, will depend on the nature of the casting, the properties required, and the quantities involved.

As is the case with any cast metal, the mechanical properties in the cast state depend not only on chemical composition and heat treatment but on a variety of factors which influence the rate of solidification from the molten state; for example, melting and pouring temperatures, gating, type of mold, section thickness, rate of chilling, etc. Consequently the strength of a commercial casting usually will differ from that of separately cast test bars and will vary in different parts of the casting. The test bar, however, serves to control the quality of the alloy and the heat treatment or other foundry practices to which the alloy is subjected.

Table IV lists the typical mechanical properties of the more common casting alloys. It will be noted that some of the alloys are supplied in several heat treated conditions to meet various engineering requirements.

### Properties of Wrought Alloys

Most of the wrought alloys are commercially available in the form of plate, sheet, strip, foil, wire, rod, bar, tubing, forgings, extruded shapes, and rolled billets, bars and shapes. Several tempers, produced either by strain hardening or heat treatment, or a combination of the two, are normally available.

The mechanical properties of the more common wrought alloys in several tempers are given in Table VIII. Those listed as Nos. 1, 2 and 3 are subject only to strain hardening and are often referred to as "common alloys." All the other alloys listed

**Table I**

## Nominal Composition of Aluminum Casting Alloys[a]

| Item | Copper, per cent | Silicon, per cent | Magnesium, per cent | Zinc, per cent | Nickel, per cent | Iron, per cent |
|---|---|---|---|---|---|---|
| No. 1 | 8.0 | .... | .... | .... | .... | .... |
| No. 2 | 2.7 | .... | .... | 13.5 | .... | .... |
| No. 3 | 2.5 | .... | .... | 11.0 | .... | 1.5 |
| No. 4 | 7.7 | 1.2 | .... | .... | .... | 1.0 |
| No. 5 | 7.0 | 2.0 | .... | 2.0 | .... | 1.2 |
| No. 6 | 12.0 | .... | .... | .... | .... | .... |
| No. 7 | 10.0 | .... | 0.2 | .... | .... | 1.2 |
| No. 8 | 4.0 | .... | .... | .... | .... | .... |
| No. 9 | 4.0 | .... | 0.3 | .... | .... | .... |
| No. 10 | 4.0 | .... | 1.5 | .... | 2.0 | .... |
| No. 11 | .... | 5.0 | .... | .... | .... | .... |
| No. 12 | .... | 12.5 | .... | .... | .... | .... |
| No. 13 | .... | .... | 3.75 | .... | .... | .... |
| No. 14 | .... | 14.0 | 1.0 | .... | 2.5 | .... |
| No. 15 | 1.25 | 5.0 | 0.5 | .... | .... | .... |
| No. 16 | .... | 7.0 | 0.3 | .... | .... | .... |
| No. 17 | .... | .... | 10.0 | .... | .... | .... |
| No. 18 | 2.0 | 3.0 | .... | .... | .... | .... |
| No. 19 | 4.0 | 5.0 | .... | .... | .... | .... |
| No. 20 | 1.5 | 1.0 | .... | .... | 2.25 | .... |
| No. 21 | 4.0 | 1.75 | .... | .... | 4.0 | .... |
| No. 22 | 8.0 | 1.5 | .... | .... | .... | .... |

[a] Aluminum content = remainder.

Table II

## Nominal Composition of Aluminum Wrought Alloys[a]

| Item | Silicon, per cent | Manganese, per cent | Copper, per cent | Nickel, per cent | Zinc, per cent | Magnesium, per cent | Other Elements, per cent |
|---|---|---|---|---|---|---|---|
| No. 1 | .... | 99 per cent minimum aluminum | | | | | |
| No. 2 | .... | 1.25 | .... | .... | .... | .... | .... |
| No. 3 | .... | 1.25 | .... | .... | .... | 1.0 | .... |
| No. 4 | 0.8 | 0.75 | 4.4 | .... | .... | 0.35 | .... |
| No. 5 | .... | 0.5 | 4.0 | .... | .... | 0.5 | .... |
| No. 6 | .... | .... | 2.5 | .... | .... | 0.3 | .... |
| No. 7 | .... | .... | 3.5 | .... | .... | 0.3 | .... |
| No. 8 | 1.25 | 0.5 | 4.0 | .... | .... | 0.5 | .... |
| No. 9 | .... | .... | 4.0 | 2.0 | .... | 0.5 | .... |
| No. 10 | .... | 0.6 | 4.2 | .... | .... | 1.5 | .... |
| No. 11 | 0.8 | 0.8 | 4.5 | .... | .... | .... | .... |
| No. 12 | 12.0 | .... | .... | 0.8 | .... | 1.0 | .... |
| No. 13 | 1.0 | .... | .... | .... | .... | 0.6 | .... |
| No. 14 | 0.7 | .... | .... | .... | .... | 1.25 | Chromium 0.25 |
| No. 15 | .... | 0.7 | 1.0 | .... | 10.0 | 0.4 | .... |
| No. 16 | .... | 0.5 | .... | .... | .... | 3.8 | .... |
| No. 17 | .... | .... | 0.5 | 1.0 | .... | 0.5 | 0.5[b] |
| No. 18 | .... | .... | 0.25 | 0.5 | .... | 0.5 | 0.25[b] |
| No. 19 | .... | .... | 1.0 | 1.0 | 1.0 | 0.75 | 0.5[b] |

[a] Aluminum content = remainder.
[b] These alloys contain chromium, manganese and molybdenum in about equal amounts; the sum of the three is shown; magnesium may be omitted.

respond to heat treatment and usually are furnished by the producer in a heat-treated temper or in a temper involving a small amount of cold work subsequent to heat treatment. For convenience, these alloys often are classed as "strong alloys."

The tempers of the common alloys depend on the amount of cold work imposed upon them, such as by rolling, drawing, or spinning, and range from annealed to full-hard. The usual intermediate tempers are one-quarter, one-half, and three-quarters hard. The strength of the alloys increases with increased cold work but the elongation and workability are decreased. Some indication of the relative workability can be secured from the bend radii data of Table VII. These alloys can be annealed from any temper by heating rapidly to the recommended annealing temperature (Table V) and cooling in air. Partial annealing of hard-rolled metal to secure intermediate tempers is not considered practical. These alloys if annealed can be rehardened only by further cold work.

### Two Strengthening Treatments

Two types of treatment are commonly used to strengthen the heat-treatable alloys; the one is a high-temperature solution treatment, the other, a lower-temperature precipitation treatment, sometimes referred to as "artificial aging."

The high-temperature solution heat treatment is applied to all of the wrought alloys in this class and consists essentially of heating in a nitrate bath or an air furnace at temperatures which depend upon the composition of the alloy. Casting alloys are not always given a solution treatment, but when they are so treated the heating is carried out in an air furnace only. Relatively close control of the heat-treating temperature is necessary in order that the desired mechanical properties and corrosion resistance may be obtained without overheating or "burning" the metal. Exposure to temperatures above the upper limits given in the sixth column of Table V may cause a serious loss in ductility. The length of time the metal is in the nitrate bath or air furnace varies with its form, size, and shape, as well as the size and type of furnace and size of load, so any figure given here might be misleading.

The solution heat treatment of wrought alloys should be followed by a rapid quench in cold water as the slower quenches induced by hot water, air, or oil will somewhat impair the corrosion resistance by producing susceptibility to intercrystalline corrosion. Delay in transferring the metal from the furnace to the quenching tank should be held to the absolute minimum to prevent impaired corrosion resistance. In some cases, castings are quenched in boiling water or oil; sacrificing some corrosion resistance to minimize quenching stresses and distortion. Since the metal when at the heat treating temperature is quite soft, some care in handling is necessary to avoid excessive warping.

### Aging May Be Retarded

The aluminum-copper-magnesium aloys of the duralumin type, such as 17S and some of its modifications, (Nos. 5, 6 and 7; Table II) age spontaneously at room temperature after having been given a solution heat

Table III

## Physical Constants of Aluminum and Magnesium

| | Aluminum | | Magnesium | |
|---|---|---|---|---|
| | | Sample Purity, per cent | | Sample Purity,[a] per cent |
| Atomic weight | 26.97 | ..... | 24.32 | ..... |
| Boiling point, deg. Cent | 1800 | ..... | 1097 | ..... |
| Crystal form | Face centered cubic | ..... | Close packed hexagonal | ..... |
| Mean coefficient of expansion 20 to 300 C. | 0.0000257 | 99.95 (cast) | 0.0000283 | ..... |
| Mean coefficient of expansion 20 to 500 C. | 0.0000277 | 99.95 (cast) | 0.0000299 | ..... |
| Density at 20 C. (68 F.), g. per cu. cm | 2.70 | 99.971 (wrought-annealed) | 1.74 | ..... |
| Density at melting point (solid), g. per cu. cm | 2.55 | ..... | 1.64 | ..... |
| Density at melting point (liquid), g. per cu. cm | 2.38 | ..... | 1.57 | ..... |
| Electrical resistivity at 20 C.: | | | | |
| Microhms per cu. cm | 2.688 | 99.968 (hard drawn) | 4.4611 | ..... |
| Ohms per cir. mil ft. (A.I.E.E. standard) | 17.01 | Commercial | 26.83 | ..... |
| Temperature coefficient at 20 C. (A.I.E.E. standard) | 0.00403 | Commercial | 0.0040 | ..... |
| Electrical conductivity at 20 C.: | | | | |
| Mass, per cent annealed copper | 212.9 | ..... | 197.7 | ..... |
| Volume, per cent annealed copper | 64.6 | ..... | 38.6 | ..... |
| Freezing point, deg. Cent | 659.8 | ..... | 651 | ..... |
| Heat of vaporization, cal. per g | 1950 to 2000 | ..... | 1300 to 1500 | ..... |
| Latent heat of fusion cal. per g | 93 | ..... | 70 | ..... |
| Latent heat of fusion B.t.u. per lb | 169.16 | ..... | 126 | ..... |
| Mechanical properties: | | | | |
| Tensile strength, lb. per sq. in | 9000 | Annealed sheet 99.95 | 27 000 | Commercial annealed sheet 99.8 to 99.9 |
| Yield strength, lb. per sq. in. (Set = 0.2 per cent) | 3000 | | 10 000 | |
| Elongation in 2 in., per cent | 60 | | 15 | |
| Brinell hardness, 10-mm. ball, 500-kg. load | 15 | | 37 | |
| Young's modulus of elasticity, lb. per sq. in | 10 000 000 | ..... | 6 250 000 | ..... |
| Modulus of rigidity (torsion), lb. per sq. in | 3 870 000 | Commercial | ..... | ..... |
| Poisson's ratio | 0.33 | ..... | ..... | ..... |
| Mean reflectivity, per cent for white light | 87 | ..... | 73 | ..... |
| Mean specific heat, cal. per g. (0 to 100 C.) | 0.226 | ..... | 0.249 | ..... |
| Thermal conductivity, c.g.s. units | 0.52 | 99.66 | 0.37 | ..... |
| Watts per sq. cm. per cm. per deg. Cent | 2.17 | 99.66 | 1.55 | ..... |
| B.t.u. per sq. ft. per in. per deg. Fahr. per hr | 1509 | ..... | 1102 | ..... |

[a] Unless otherwise noted the magnesium used in the determination of many of the above properties had a purity of 99.9 to 99.99 per cent. Metal of approximately the same purity was probably used in the determination of the other properties, although the literature is silent on this point.

treatment. This aging proceeds rather rapidly at first, but the rate decreases with time and the phenomenon is practically complete in four days. Experiments have shown that this aging can be retarded for extended periods by storing the heat-treated material at 0 degrees Cent. (32 degrees Fahr.), or below, and that normal aging will set in on removal from the low-temperature storage.

### Artificial Aging Process

The other heat-treatable wrought alloys of Table II are aged at elevated temperatures, or in common terms, "artificially aged" to secure maximum strength and hardness. Certain of the casting alloys are also given aging treatments to increase further their strength and hardness but, in contrast to the common procedure for wrought alloys, castings may sometimes be aged without a preceding solution heat treatment. Aging is accomplished in steam chambers or an air furnace operating at temperatures of about 300 degrees Fahr. (150 degrees Cent.). The aging period varies with the alloy and, to some extent (more so in castings), with the combination of properties desired but is usually 12 to 18 or 24 hours. Accurate control of time and temperature is not so important in aging as in heat treating, but for consistently reliable results should not be subject to marked variations.

The wrought strong-alloys exhibit excellent workability in the heat-treated temper, but subsequent aging, either spontaneous or artificial somewhat reduces this property. On account of the reduced workability inherent in aged material, it is advisable to carry out any severe forming operations, such as heading rivets, in the interval between heat treating and aging. In the case of artificially aged alloys the time elapsing between heat treating and forming is not very important but with duralumin or 17S (Nos. 5, 6 and 7; Table II) the more severe forming must be accomplished within a few hours after the material has been heat treated or removed from a low-temperature storage.

### Lower Corrosion Resistance

In general, the corrosion resistance of the wrought alloys in the heat-treated temper is somewhat lower than that usually associated with the common alloys and is usually further decreased by artificial aging or other low-temperature reheating. In this latter connection, it should be noted that many of the treatments involved with baked finishes will produce some artificial aging in the strong alloys and may then reduce the corrosion resistance or mechanical properties or both. The alloy listed as No. 14 in the wrought alloy tables is unique in this respect, in that its corrosion resistance is excellent regardless of the temper.

The annealed temper of the strong alloys is available commercially for use where ultimate workability is necessary and subsequent heat treatment is practical. The strong alloys

**Table V**

## Fabricating Characteristics of Aluminum Wrought Alloys

| Item | Welding[a] | | Machining | Polishing and Buffing | Heat Treatment[d] | | Mechanical Working[a] | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Ease of Working | | | |
| | Gas | Electric Arc | | | deg. Fahr. | deg. Cent. | Operation | Temperature | Annealed | Half Hard | Hard | Heat Treated |
| Nos. 1 to 3 | Yes | Yes | Good[c] | Good | Anneal[d] | Anneal[d] | Drawing | Cold | Excellent | Good | Fair | .... |
| No. 4 | [b] | Yes | Good[c] | Good | 920–940 | 495–505 | Drawing | [g] | ..... | .... | ... | Good |
| No. 5 | [b] | Yes | Good[c] | Good | 930–950 | 500–510 | Drawing | [g] | ..... | .... | ... | Good |
| No. 6 | [b] | Yes | Good[c] | Good | 930–950 | 500–510 | Drawing | [g] | ..... | .... | ... | Good |
| No. 7 | [b] | Yes | Good[c] | Good | 930–950 | 500–510 | Drawing | [g] | ..... | .... | ... | Good |
| No. 8 | [b] | Yes | Good[c] | Good | 920–940[f] | 495–505[f] | Drawing | [g] | ..... | .... | ... | Good |
| No. 9 | [b] | Yes | Good[c] | Good | 950–970 | 510–520 | Forging | Hot | ..... | .... | ... | Good |
| No. 10 | [b] | Yes | Good[c] | Good | 910–930 | 490–500 | Drawing | [g] | ..... | .... | ... | Good |
| No. 11 | [b] | Yes | Good[c] | Good | 960–980[e] | 515–525[e] | Forging | Hot | ..... | .... | ... | Good |
| No. 12 | [b] | Yes | Good[c] | Good | 950–970 | 510–520 | Forging | Hot | ..... | .... | ... | Good |
| No. 13 | [b] | Yes | Good[c] | Good | 960–980[f] | 515–525[f] | Drawing | [g] | ..... | .... | ... | Good |
| No. 14 | Yes | Yes | Good[c] | Good | 960–980[f] | 515–525[f] | Drawing | [g] | ..... | .... | ... | Good |
| No. 15 | [b] | Yes | Good[c] | Good | 870–890 | 465–475 | Forging | Hot | ..... | .... | ... | Good |
| No. 16 | Yes | Yes | Good[c] | Good | None | None | ..... | .... | ..... | .... | ... | .... |
| Nos. 17 to 19 | Yes | Yes | Good[c] | Good | 940–960[h] | 505–515[h] | Drawing | [g] | ..... | .... | ... | Very Good |

[a] For details, consult manufacturer.
[b] Gas welding these alloys generally not recommended.
[c] With proper tools.
[d] Alloy 1 anneals at 650 F. (345 C.); 2 and 3 at 750 F. (400 C.).
[e] Age 8 to 15 hours at 290 F. (145 C.) for maximum strength.
[f] Age 18 hours at 320 F. (160 C.) for maximum strength.
[g] Hot or cold depending on job.
[h] May be aged 8 to 24 hours at 290 to 310 F. (145 to 155 C.).

**Table IV**

## Mechanical Properties of Aluminum Casting Alloys[a]

Modulus of elasticity is 10,000,000 lb. per sq. in.

| Item | Temper[b] | Tensile Strength, lb. per sq. in. | Yield Strength (Set = 0.2 per cent), lb. per sq. in. | Elongation in 2 in., per cent | Brinell Hardness Number[c] | Shearing Strength, lb. per sq. in. | Charpy Impact, ft-lb.[d] | Compressive Strength, lb. per sq. in.[e] | Endurance Limit, lb. per sq. in.[f] | Density |
|---|---|---|---|---|---|---|---|---|---|---|
| No. 1 | AC | 22 000 | 14 000 | 2.0 | 65 | 20 000 | 0.70 | 38 000 | 7 500 | 0.102 |
| No. 2 | AC | 25 000 | ..... | 1.0 | ..... | ..... | ..... | ..... | ..... | ..... |
| No. 3 | AC | 29 000 | 22 000 | 4.0 | 70 | 22 500 | 2.00 | 50 000 | 7 500 | 0.106 |
| No. 4 | AC | 22 000 | 14 000 | 2.0 | 65 | 20 000 | 0.70 | 38 000 | 7 500 | 0.102 |
| No. 5 | AC | 22 000 | 14 000 | 2.0 | 70 | 20 000 | 0.59 | 44 000 | 8 500 | 0.103 |
| No. 6 | AC | 24 000 | 18 000 | 1.5 | 75 | 20 000 | 0.63 | 45 000 | 10 000 | 0.105 |
| No. 7 | HT-A | 36 000 | 30 000 | 1.0 | 100 | 29 500 | 0.68 | 80 000 | ..... | 0.103 |
| No. 8 | HT | 31 000 | 16 000 | 8.0 | 65 | 27 000 | 2.80 | 43 000 | 6 000 | 0.100 |
| | HT-A | 36 000 | 22 000 | 4.0 | 80 | 29 000 | 1.80 | 43 000 | 6 000 | 0.100 |
| No. 9 | HT-A | 38 000 | 34 000 | 1.0 | 100 | 34 000 | 1.81 | 64 000 | 6 500 | 0.100 |
| No. 10 | AC | 28 000 | 24 000 | 1.0 | 85 | 24 000 | 0.62 | 52 000 | 8 000 | 0.100 |
| | HT-A | 37 000 | ..... | 0.5 | 100 | 32 000 | 0.59 | 70 000 | 8 000 | 0.100 |
| No. 11 | AC | 19 000 | 9 000 | 4.0 | 40 | 15 000 | 0.98 | 25 000 | 6 500 | 0.096 |
| | AC* | 29 000 | 12 000 | 3.5 | ..... | ..... | 4.50 | ..... | ..... | ..... |
| No. 12 | Modified | 26 000 | 11 000 | 8.0 | 50 | 18 000 | 3.00 | 28 000 | 6 000 | 0.095 |
| | AC* | 33 000 | 16 000 | 1.5 | 80 | ..... | 2.00 | ..... | ..... | ..... |
| No. 13 | AC | 25 000 | 12 000 | 9.0 | 50 | 19 000 | 3.80 | 50 000 | 5 500 | 0.095 |
| No. 14 | HT-A | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| No. 15 | HT | 30 000 | 20 000 | 4.0 | 60 | 30 000 | 1.26 | 65 000 | ..... | 0.097 |
| | HT-A | 35 000 | 27 000 | 2.0 | 80 | 30 000 | 1.08 | 68 000 | ..... | 0.097 |
| No. 16 | HT | 28 000 | 16 000 | 6.0 | 55 | 22 000 | 1.65 | 46 000 | ..... | 0.095 |
| | HT-A | 32 000 | 22 000 | 4.0 | 70 | 23 000 | 1.00 | 48 000 | 8 000 | 0.095 |
| No. 17 | HT | 44 000 | 26 000 | 13.0 | 75 | 33 500 | 4.50 | 72 500 | 7 500 | 0.092 |
| No. 18 | AC* | 30 000 | 13 000 | 3.5 | 100 | ..... | 5.00 | ..... | ..... | ..... |
| No. 19 | AC* | 32 000 | 18 000 | 2.0 | 60 | ..... | 2.50 | ..... | ..... | ..... |
| No. 20 | AC* | 29 000 | ..... | 4.0 | ..... | ..... | 4.50 | ..... | ..... | ..... |
| No. 21 | AC* | 21 000 | 19 000 | 1.5 | 80 | ..... | 2.00 | ..... | ..... | ..... |
| No. 22 | AC* | 33 000 | 25 000 | 1.0 | 80 | ..... | 1.50 | ..... | ..... | ..... |

[a] Tension test results obtained on standard $\frac{1}{2}$-in. diameter, sand-cast bars except where marked with an asterisk (*) in "temper" column, in which case they were $\frac{1}{4}$-in. diameter die-cast bars.
[b] AC = as cast; HT = heat treated; HT-A = heat treated and aged.
[c] 500-kg. load, 10-mm. ball.
[d] The Charpy impact values for sand castings are from bars 10 mm. square and having a notch 5 mm. deep with a 1 mm. radius at the bottom; for die castings, a $\frac{1}{4}$-in. square bar, 3 in. long and with a notch, was used.
[e] Specimens having $L/r$ ratio of 16 to 20. All failed by lateral bending.
[f] R.R. Moore type machine — 500,000,000 cycles.

Table VI

## Composition of Aluminum Ingot

| Item | Aluminum, per cent, min. | Copper, per cent, max. | Zinc, per cent, max. | Iron, per cent, max. | Silicon, per cent, max. | Manganese, per cent, max. | Magnesium, per cent, max. | Remarks |
|---|---|---|---|---|---|---|---|---|
| No. 1[a] | 98.0 | .... | .... | .... | .... | .... | .... | For use in manufacture of iron and steel. |
| | 94.0 | .... | 0.5 | .... | .... | .... | .... | |
| | 90.0 (A Grade) | .... | 0.5 | .... | .... | .... | .... | |
| | 90.0 (B Grade) | .... | 4.0 | .... | .... | .... | .... | |
| No. 2[b] | 99.5 | 0.10 | .... | .... | .... | .... | .... | For remelting. |
| | 99.0 | 0.25 | .... | .... | .... | .... | .... | |
| | 98.5 | 0.45 | .... | .... | .... | .... | .... | |
| No. 3[c] | 99.0 | 0.10 | 0.03 | 0.60 | 0.50 | 0.03 | 0.03 | For remelting. |
| | 98.0 | .... | 0.2 | (iron + silicon, 1.5, max. | | 0.30 | 0.03 | |

[a] Standard Specifications for Aluminum for use in the Manufacture of Iron and Steel (B 37 - 26), 1933 Book of A.S.T.M. Standards, Part I, p. 868.
[b] Standard Specifications for Aluminum Ingots for Remelting (B 24 - 29), 1933 Book of A.S.T.M. Standards, Part I, p. 566.
[c] Federal Specification for Aluminum Ingots (QQ-A-451), Federal Specifications Board, Washington, D. C.

(except Nos. 13 and 14) in this temper have a relatively poor resistance to corrosion and, therefore, should never be placed in service without subsequent heat treatment. In some cases, rather difficult forming operations can be accomplished by heating the material to the heat-treating temperature and depending on the cold dies to secure a rapid quench (U. S. patent No. 1,751,500). This procedure will generally produce formed material with properties essentially equivalent to those in Table VIII, but the corrosion resistance may be inferior to that of properly heat-treated material.

The strong alloys in any temper may be heat treated or reheat treated a reasonable number of times without deleterious effect and, if necessary, may be annealed from any temper by following the recommended procedure. If the alloy to be annealed is in the heat-treated temper the procedure which gives maximum workability is a "soak" for some time at about 800 degrees Fahr. (25 degrees Cent.) and slow cool in the furnace to about 450 degrees Fahr. (230 degrees Cent.) before removal to the air. To remove strain hardening from metal which has not been heat treated, or to secure fair workability in heat-treated material, annealing at 650 degrees Fahr. (345 degrees Cent.) will be satisfactory.

### Proper Welding Procedure

The wrought aluminum alloys are readily welded by experienced operators using either fusion or electric-resistance methods. Fusion welding of the strong alloys is not recommended in any case unless subsequent reheat treatment is possible. Fusion-welded joints have essentially a cast structure and hence are normally of lower unit strength than the welded sheet. With the commonly used welding materials, they are likewise not subject to improvement by heat treatment. The fusion processes are excellent for producing liquid-light joints in the common alloys, but the joints in most cases are not so strong as the unwelded sheet. Spot and seam welding will produce consistently reliable joints when done on machines equipped with acurate electronic control. Subsequent reheat treatment is not necessary as the properties are not affected as in fusion welding.

### Casting Alloys Are Weldable

Most casting alloys are also readily welded by fusion methods. The technique is somewhat more involved than for wrought alloys due to the possibility of thermal strains and cracks, but can be easily acquired by experience. Heat-treated castings should not be welded unless subsequent heat treatment is possible. Welding rod of the same composition as the casting is used in most cases and permits appreciable improvement in strength on heat treatment if it is of a heat-treatable alloy.

The soldering of aluminum and its alloys can be accomplished but it is

Table VII

## Typical Bend Radii for 180-Degree Cold Bend for Wrought Aluminum Alloys

| Item | Temper | $\frac{1}{64}$-in. Sheet | $\frac{1}{32}$-in. Sheet | $\frac{1}{16}$-in. Sheet | $\frac{1}{8}$-in. Sheet | $\frac{3}{16}$-in. Sheet | $\frac{1}{4}$-in. Sheet |
|---|---|---|---|---|---|---|---|
| No. 1 | O | 0 rad. | 0 rad. | 0 rad. | 0 rad. | 0 rad. | 0 rad. |
| | $\frac{1}{2}$ H | 0 rad. | 0 rad. | 0 rad. | 0 rad. | 0 rad. | 0 to 1$t$ |
| | H | 0 to 1$t$ | 0 to 1$t$ | 0 to 1$t$ | $\frac{1}{2}$ to 1$\frac{1}{2}t$ | ..... | ..... |
| No. 2 | O | 0 rad. | 0 rad. | 0 rad. | 0 rad. | 0 rad | 0 rad. |
| | $\frac{1}{2}$ H | 0 rad. | 0 rad. | 0 rad. | 0 to 1$t$ | 0 to 1$t$ | $\frac{1}{2}$ to 1$\frac{1}{2}t$ |
| | H | 0 to 1$t$ | 0 to 1$t$ | $\frac{1}{2}$ to 1$\frac{1}{2}t$ | 1 to 2$t$ | ..... | ..... |
| No. 3 | O | 0 rad. | 0 rad. | 0 rad. | 0 rad. | 0 rad. | 0 rad. |
| | $\frac{1}{2}$ H | 0 to 1$t$ | $\frac{1}{2}$ to 1$\frac{1}{2}t$ | 1 to 2$t$ | 1$\frac{1}{2}$ to 3$t$ | 3 to 5$t$ | 4 to 6$t$ |
| | H | 1$\frac{1}{2}$ to 3$t$ | 2 to 4$t$ | 3 to 5$t$ | 4 to 6$t$ | ..... | ..... |
| No. 5 | O | 0 rad. | 0 rad. | 0 rad. | 0 to 1$t$ | $\frac{1}{2}$ to 1$\frac{1}{2}t$ | 1 to 2$t$ |
| | T | $\frac{1}{2}$ to 1$\frac{1}{2}t$ | 1 to 2$t$ | 1$\frac{1}{2}$ to 3$t$ | 2 to 4$t$ | 3 to 5$t$ | 4 to 6$t$ |
| | RT | 1$\frac{1}{2}$ to 3$t$ | 2 to 4$t$ | 3 to 5$t$ | 4 to 6$t$ | 4 to 6$t$ | ..... |
| No. 6 | O | 0 rad. | 0 rad. | 0 rad. | 0 rad. | 0 rad. | 0 to 1$t$ |
| | T | 0 to 1$t$ | 0 to 1$t$ | $\frac{1}{2}$ to 1$\frac{1}{2}t$ | 1 to 2$t$ | 1$\frac{1}{2}$ to 3$t$ | 2 to 4$t$ |
| No. 7 | O | 0 rad. | 0 rad. | 0 rad. | 0 rad. | 0 to 1$t$ | 0 to 1$t$ |
| | T | 0 to 1$t$ | $\frac{1}{2}$ to 1$\frac{1}{2}t$ | 1 to 2$t$ | 1 to 2$t$ | 1$\frac{1}{2}$ to 3$t$ | 2 to 4$t$ |
| No. 10 | O | 0 rad. | 0 rad. | 0 rad. | 0 to 1$t$ | $\frac{1}{2}$ to 1$\frac{1}{2}t$ | 1 to 2$t$ |
| | T | 1 to 2$t$ | 1$\frac{1}{2}$ to 3$t$ | 2 to 4$t$ | 3 to 5$t$ | 4 to 6$t$ | 4 to 6$t$ |
| | RT | 2 to 4$t$ | 3 to 5$t$ | 3 to 5$t$ | 4 to 6$t$+ | 4 to 6$t$+ | ..... |
| No. 13 | O | 0 rad. | 0 rad. | 0 rad. | 0 rad. | 0 rad. | 0 rad. |
| | W | 0 to 1$t$ | $\frac{1}{2}$ to 1$\frac{1}{2}t$ | $\frac{1}{2}$ to 1$\frac{1}{2}t$ | 1$\frac{1}{2}$ to 3$t$ | 2 to 4$t$ | 3 to 5$t$ |
| | T | 2 to 4$t$ | 3 to 5$t$ | 3 to 5$t$ | 4 to 6$t$ | ..... | ..... |
| No. 14 | O | 0 rad. | 0 rad. | 0 rad. | 0 rad. | 0 rad. | 0 rad. |
| | H | 0 to 1$t$ | 0 to 1$t$ | $\frac{1}{2}$ to 1$\frac{1}{2}t$ | 1 to 2$t$ | ..... | ..... |
| | W | 0 to 1$t$ | $\frac{1}{2}$ to 1$\frac{1}{2}t$ | $\frac{1}{2}$ to 1$\frac{1}{2}t$ | 1$\frac{1}{2}$ to 3$t$ | 2 to 4$t$ | 3 to 5$t$ |
| | T | 2 to 4$t$ | 3 to 5$t$ | 3 to 5$t$ | 4 to 6$t$ | ..... | ..... |
| No. 17 | O | ..... | ..... | 0 rad. | ..... | ..... | ..... |
| | 2 | ..... | ..... | 0 rad. | ..... | ..... | ..... |
| | H | ..... | ..... | 2 to 4$t$ | ..... | ..... | ..... |
| | CO | ..... | ..... | 0 rad. | ..... | ..... | ..... |
| | D 018 | ..... | ..... | 1$\frac{1}{2}$ to 3$t$ | ..... | ..... | ..... |
| | D 2012 | ..... | ..... | 1$\frac{1}{2}$ to 3$t$ | ..... | ..... | ..... |
| | D 6418 | ..... | ..... | 4 to 6$t$ | ..... | ..... | ..... |
| No. 18 | O | ..... | ..... | 0 rad. | ..... | ..... | ..... |
| | 2 | ..... | ..... | 0 rad. | ..... | ..... | ..... |
| | H | ..... | ..... | 2 to 4$t$ | ..... | ..... | ..... |
| | CO | ..... | ..... | 0 rad. | ..... | ..... | ..... |
| | D 08 | ..... | ..... | 1$\frac{1}{2}$ to 3$t$ | ..... | ..... | ..... |
| No. 19 | MO | ..... | ..... | ..... | ..... | 0 rad. | ..... |
| | CO | ..... | ..... | 1$\frac{1}{2}$ to 3$t$ | ..... | ..... | ..... |
| | D 2018 | ..... | ..... | 4 to 6$t$+ | ..... | ..... | ..... |
| | D 4418 | ..... | ..... | 3 to 5$t$ | ..... | ..... | ..... |

NOTE.—$t$ = thickness of sheet.

not recommended for highly stressed joints and the joint should be given adequate protection to prevent localized corrosion.

In the tables which accompany this article and in the tables which will accompany subsequent installments will be found three different sets of "item numbers," each beginning with No. 1. It will be found, however, that throughout all tables refering to the same class of materials (as aluminum casting alloys) a given "item number" always describes the same alloy. This has been done so that future expansions of the tables referring to a given class of material will be by consecutive numerical additions within that class. The reader is cautioned to bear in mind that the first column of each table gives *item numbers* and *not alloy numbers.*

*(To be continued)*

## Improves Design and Extends Its Line of Crushers

American Pulverizer Co., St. Louis, has broadened its line of crushing machinery by making a number of additions to its ring crushers and by building a complete assortment of hammermills. The company also has improved its design and now is making crushers with heavy cast steel housings, reinforced with ribs and provided with manganese steel sectional liners. These liners may be replaced when worn, thus giving the housing indefinite life. Another improvement involves equipping these crushers with antifriction bearings which are oversize and mounted in dust and oil tight housings. Grinding parts, including breaker plate, grinding plate, grate bars and rings, are manganese steel castings. The rotor consists of an alloy steel main shaft with steel disks and spiders or cross arms keyed to the main shaft. Shafts supporting the rings are of high carbon or alloy steel, with the rings installed in a staggered arrangement so as to cover the entire grinding surface of the machine. Each rotor is balanced after it is assembled. These machines also are given protection against tramp material; the rings are thrown back when they encounter non-crushable material.

## A.S.T.M. Publishes Report On Corrosion Tests

Many of the important exposure tests under way are discussed in detail in the latest report of the American Society for Testing Materials' committee A-5 on corrosion of iron and steel. A complete record is given of failures observed at all inspections of the Nos. 16 and 22 gage uncoated copper-bearing and non-copper-bearing sheets which have been exposed to the atmosphere at Annapolis since October, 1916. Extensive tables also give the failures in the No. 16 gage sheets immersed in sea water at Key West, Fla., and Portsmouth, N. H., since March 1927.

Detailed tabular records and discussion cover the field tests on galvanized sheets which have been on exposure racks at several locations since April, 1926. Coating failures are indicated and data on progressive development of rust are given in the report. Records of perforations of uncoated sheets which are exposed with the coated specimens are given also.

The general plans for the extensive field tests of wire and wire products are discussed, followed by important details of the materials shortly to be exposed to atmospheric corrosion.

Copies of this 32-page report are available at 50 cents each from A.S.T.M. headquarters, 260 South Broad street, Philadelphia.

**Table VIII**

## Mechanical Properties of Aluminum Wrought Alloys[a]

Modulus of elasticity is 10,000,000 lb. per sq. in.

| Item | Temper[b] | Material Tested | Tensile Strength, lb. per sq. in. | Yield Strength (Set = 0.2 per cent), lb. per sq. in.[c] | Elongation in 2 in., per cent | Brinell Hardness Numbers[d] | Rockwell Hardness Numbers[e] | Shearing Strength, lb. per sq. in.[f] | Endurance Limit, lb. per sq. in.[g] |
|---|---|---|---|---|---|---|---|---|---|
| No. 1 | O | Rod | 13 000 | 4 000 | 40 | 23 | S-23 | 9 500 | 5 000 |
| | ½H | | 17 000 | 14 000 | 20 | 32 | E-22 | 11 000 | 7 000 |
| | H | | 24 000 | 21 000 | 10 | 44 | E-43 | 13 000 | 8 500 |
| No. 2 | O | | 16 000 | 5 000 | 40 | 28 | S-52 | 11 000 | 7 000 |
| | ½H | | 21 000 | 18 000 | 20 | 40 | E-51 | 14 000 | 9 000 |
| | H | | 29 000 | 25 000 | 10 | 55 | E-68 | 16 000 | 10 000 |
| No. 3 | O | | 26 000 | 10 000 | 20 | 45 | E-51 | 16 000 | 14 000 |
| | ½H | | 35 000 | 31 000 | 10 | 65 | E-77 | 19 000 | 15 000 |
| | H | | 42 000 | 38 000 | 5 | 80 | E-88 | 22 000 | 16 000 |
| No. 4 | O | | 27 000 | 11 000 | 23 | 44 | E-51 | 18 000 | 10 500 |
| | W | | 62 000 | 38 500 | 25 | 106 | E-98 | 40 500 | 15 000 |
| | T | | 69 000 | 53 000 | 18 | 125 | E-104 | 44 500 | 15 500 |
| No. 5 | O | | 26 000 | 10 000 | 20 | 45 | E-54 | 18 000 | 11 000 |
| | T | | 58 000 | 35 000 | 20 | 100 | E-96 | 35 000 | 15 000 |
| | RT | | 63 000 | 46 000 | 13 | 110 | E-98 | 36 000 | ..... |
| | Alclad T | Sheet | 55 000 | 32 000 | 18 | ... | ..... | 32 000 | ..... |
| | Alclad RT | Sheet | 55 000 | 40 000 | 11 | ... | ..... | 33 000 | ..... |
| No. 6 | O | Rod | 22 000 | 8 000 | 22 | 38 | E-37 | 15 000 | ..... |
| | T | | 40 000 | 22 000 | 22 | 70 | E-79 | 25 000 | 13 500 |
| No. 7 | O | | 22 000 | 8 000 | 22 | 38 | E-37 | 15 000 | ..... |
| | T | | 48 000 | 25 000 | 20 | 85 | E-87 | 29 000 | 15 000 |
| No. 8 | O | | 28 000 | 12 000 | 18 | 48 | E-54 | 19 000 | ..... |
| | T | | 65 000 | 52 000 | 10 | 118 | E-100 | 37 000 | 13 500 |
| No. 9 | W | | 54 000 | 31 000 | 20 | 91 | E-92 | 34 000 | ..... |
| | T | | 57 000 | 36 000 | 10 | 100 | ..... | ..... | ..... |
| No. 10 | T | | 65 000 | 43 000 | 20 | 105 | E-97 | 40 000 | 14 000 |
| | RT | | 68 000 | 53 000 | 13 | 116 | E-99 | 41 000 | 14 500 |
| | Alclad T | Sheet | 60 000 | 40 000 | 18 | ... | ..... | 39 000 | ..... |
| | Alclad RT | Sheet | 62 000 | 49 000 | 11 | ... | ..... | 39 000 | ..... |
| No. 11 | O | | 26 000 | 10 000 | 20 | 45 | E-54 | 18 000 | 9 000 |
| | W | | 48 000 | 25 000 | 18 | 85 | E-87 | 29 000 | 14 500 |
| | T | | 58 000 | 35 000 | 20 | 100 | E-96 | 35 000 | 15 000 |
| No. 12 | T | | 55 000 | 46 000 | 6 | 98 | E-94 | 38 000 | 14 000 |
| No. 13 | O | | 16 000 | 6 000 | 30 | 28 | S-52 | 11 000 | 6 500 |
| | W | Rod | 35 000 | 20 000 | 24 | 65 | E-75 | 24 000 | 10 500 |
| | T | | 48 000 | 38 000 | 14 | 95 | E-92 | 32 000 | 10 500 |
| No. 14 | O | | 16 000 | 6 000 | 30 | 28 | S-52 | 10 000 | 7 500 |
| | H | | 28 000 | 26 000 | 8 | 48 | E-56 | 18 000 | ..... |
| | W | | 32 000 | 19 000 | 25 | 60 | E-75 | 23 000 | ..... |
| | T | | 35 000 | 28 000 | 20 | 74 | E-83 | 24 000 | 11 000 |
| No. 15 | T | | 56 000 | 48 000 | 18 | 98 | E-94 | 37 000 | 21 000[h] |
| No. 17 | O | | 21 000 | 8 500 | 20 | ... | S-72 | ..... | ..... |
| | 2 | | 26 000 | 24 500 | 5 | ... | S-90 | ..... | ..... |
| | H | | 38 000 | 35 500 | 4 | ... | E-80 | ..... | ..... |
| | CO | | 28 500 | 15 500 | 20 | ... | S-88 | ..... | ..... |
| | DO18 | | 45 000 | 38 000 | 9 | ... | E-91 | ..... | ..... |
| | D2012 | | 46 000 | 40 500 | 10 | ... | E-91 | ..... | ..... |
| | D6418 | | 53 000 | 51 000 | 3 | ... | E-95 | ..... | ..... |
| No. 18 | O | Sheet | 17 000 | 6 500 | 26 | ... | S-58 | ..... | ..... |
| | 2 | | 22 000 | 20 500 | 8 | ... | S-81 | ..... | ..... |
| | H | | 34 500 | 32 500 | 4 | ... | E-73 | ..... | ..... |
| | CO | | 18 500 | 9 600 | 26 | ... | S-71 | ..... | ..... |
| | DO8 | | 40 000 | 32 000 | 13 | ... | E-85 | ..... | ..... |
| No. 19 | MO | | 25 500 | 11 500 | 20 | ... | S-81 | ..... | ..... |
| | CO | | 44 500 | 27 000 | 21 | ... | E-84 | ..... | ..... |
| | D2018 | | 57 000 | 48 500 | 10 | ... | E-102 | ..... | ..... |
| | D4418 | | 65 500 | 64 000 | 2 | ... | E-104 | ..... | ..... |
| | DO18 | Rod | 55 000 | 42 000 | 17 | ... | ..... | ..... | ..... |

[a] Tension test results obtained on standard A.S.T.M. ½-in. diameter specimens except where noted as sheet ($\frac{1}{16}$ in. thick) specimens.

[b] O = Annealed.
½H = Half hard.
H = Hard.
2 = Intermediate temper.
D 2018 or D 2012 = Heat treated, rolled and aged.
D 4418 or D 6418 = Heat treated, rolled, aged and rolled.
W or CO = Solution heat treated.
T or DO = Heat treated and aged.
RT = Heat treated, aged and cold rolled.
MO = Heat treatable.

[c] Yield strength in compression is practically the same as in tension.

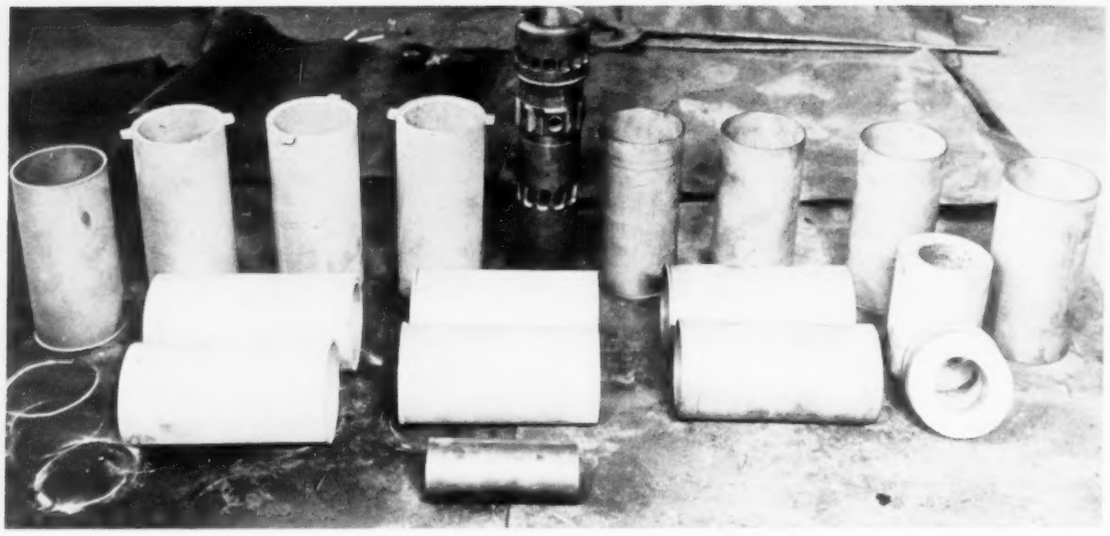
[d] 500-kg. load on 10-mm. ball.

[e] S = 60-kg. major load on ¼-in. ball; E = 100-kg. major load on ½-in. ball.

[f] Single shear values from double shear tests.

[g] R. R. Moore type rotating-beam machine; 500,000,000 cycles.

[h] Estimated from incomplete results.



*A group of Nitricastiron tubes produced by the centrifugal casting process. Some are in the as-cast conditions; others are finish machined. A diesel engine cylinder sleeve is shown in the center rear*

# Centrifugally-Cast Nitrided Iron Tubes Resist Wear

BY E. F. ROSS
Associate Editor, STEEL

NITRIDED cast iron possesses a high degree of surface hardness and has the ability to retain this hardness at temperatures up to 950 degrees Fahr. Because of these properties, the material develops exceptional wear resistance and thereby is finding increasing acceptance in many fields in which wear is an important consideration. One type of casting which is attracting attention at the present and which holds much promise for the future is that of centrifugally cast tubes, sleeves and bushings, used principally for cylinder liners in internal combustion engines, for cylinder liners in pumps handling erosive material, for capstans of wire drawing mills, and for drill guide and spindle bushings.

### Hardened by Nitriding

Centrifugally cast nitrided iron is produced exclusively in the United States by the Forging & Casting Corp., Ferndale Mich. The material is known as "Nitricastiron," a word coined to designate the alloyed cast irons which can be subjected satisactorily to the surface hardening treatment of nitriding, which consists in heating the articles to be hardened in an atmosphere of ammonia in a closed box to a carefully regulated temperature for a definitely prolonged period. It is an alloyed cast iron, the composition and manufacture of which has been the subject of extensive research, culminating in a product capable of heat treatment for development of ideal metallographic structure suitable for obtaining a very hard and tough case.

### Analysis Rather Broad

The iron is a low carbon cast iron containing chromium, molybdenum and aluminum as the principal alloys. The range of analysis is rather large, and changes with the size of the castings and whether sand cast or centrifugal molded. A typical analysis range for centrifugally cast cylinder liners with approximately $\frac{3}{8}$-inch wall is as follows: Total carbon, 2.50-2.70; chromium, 1.20-1.50; manganese, 0.50-0.60; silicon, 2.40-2.60; aluminm, 0.80-1.10; and molybdenum, 0.20-0.25 per cent.

In the Ferndale plant, the iron is prepared from pig iron and high-carbon steel scrap melted and refined in a 250-pound Moore-type electric furnace. The aluminum is added to the ladle and is protected from oxidation through the use of cryolite as a flux. The iron is poured at a temperature of approximately 2700 degrees Fahr. To provide complete chemical control over the raw materials as well as the quality of the finished product, a well equipped laboratory is maintained in the plant.

The tubes are made in a horizontal centrifugal casting machine which rotates at speeds ranging between 600 and 1400 revolutions per minute, the speed being controlled through use of a slip-ring motor and a manually-operated controller. Molds consist of mild steel forgings which have been bored to proper inside diameter to give the desired outside diameter of the tube. Wall thickness of the tube is controlled by the amount of iron poured into the mold.

The correct amount of metal is weighed into a hand ladle, then poured into the spinning mold. Freezing of the iron begins at once and is complete in less than a minute, after which the tube can be extracted from the mold immediately and the process repeated. Before the iron is poured, the inside of the mold is coated with a light layer of soot deposited by an oxyacetylene hand torch burning an acetylene-rich mixture. When a mold becomes too warm after repeated use, it is removed from the machine and another is substituted.

### Heat Treating Necessary

Nitricastiron is unsuited for use in the as-cast condition and heat treatment is required to develop the proper structure and properties. As cast, it consists of finely laminated pearlite and very fine graphite flakes with considerable quantities of free carbides. The tensile strength is approximately 50,000 pounds per square inch and the brinell hardness 400 to 450. Fractures appear to range from chilled to mottled.

Heat treatment of the centrifugally cast tubes consists of heating them to 1750 degrees Fahr., holding for 1 hour, air cooling, reheating to 1475 degrees, holding for 1 hour, and again air cooling. This renders the

castings uniformly machinable with a brinell hardness of 280 to 320, a tensile strength of approximately 60,000 pounds per square inch, and a modulus of elasticity of about 25,000,000 pounds. The microstructure has been changed by the formation of fine particles of temper carbon in addition to the original graphite; the as-cast pearlite has coalesced into a sorbitic structure and considerable amounts of original free carbides have been absorbed so that the remaining carbides are not excessive.

The centrifugally cast tubes are supplied to customers in the heat treated but unmachined condition. The qualities of hardness and uniformity of the tubes are such as to make machining and finishing operations simple and rapid. In general, tungsten carbide tipped tools or stellite tools are employed, using fairly high speeds, and light cuts and feeds. Speeds from 70 to 90 feet per minute, with ⅛-inch cuts and feeds of 35 to 50 cuts per inch are customary. The outside and inside diameters are rough machined, following which the inside diameter is ground to size or within 0.001-inch of finished size.

### Machining Thin Walled Tubes

Proper mandrels and chucks are required to expedite the machining operations on thin-walled liners. Where cylinders with very light walls are to be produced, it is desirable generally first to rough machine the tubes and then to relieve machining strains by heating the tubes to about 1150 degrees Fahr. for several hours. This stress relieving treatment is designed to eliminate the possibility of distortion during nitriding. Final machining operations on light walled tubes should be performed with light cuts to avoid setting up strains in the body of the metal due to machining.

As previously pointed out, the great usefulness of Nitricastiron is due to its ability to develop an extremely hard case on surface exposed to an atmosphere of ammonia at elevated temperatures, which treatment is known as nitriding. The same process and equipment used for nitriding steels is employed for the centrifugally cast iron. In general, electric furnaces equipped with automatic temperature control are used and the parts to be nitrided are placed carefully on racks and covered with a hood of non-nitriding metal in which the concentration and pressure of ammonia can be controlled conveniently. The temperature of 960 degrees Fahr. has been found to give satisfactory depths and quality of hardness when maintained for a period of between 50 and 60 hours. At the end of this time, the heat is lowered to below 250 degrees with the ammonia atmosphere maintained, after which the pieces can be air cooled.

In nitriding centrifugally cast cylinder liners or tubes, it generally is desirable to harden only the inside diameter and to leave the outer surface soft. This can be accomplished by several methods, one of which is to nickel plate the tubes to a thickness of 0.001-inch or slightly less, using a double salt electroplating bath with no agitation and low current to produce a dense, nonlustrous nickel deposit. After plating, the inside diameters are ground to size, thereby removing the nickel and providing a clean surface ready for nitriding.

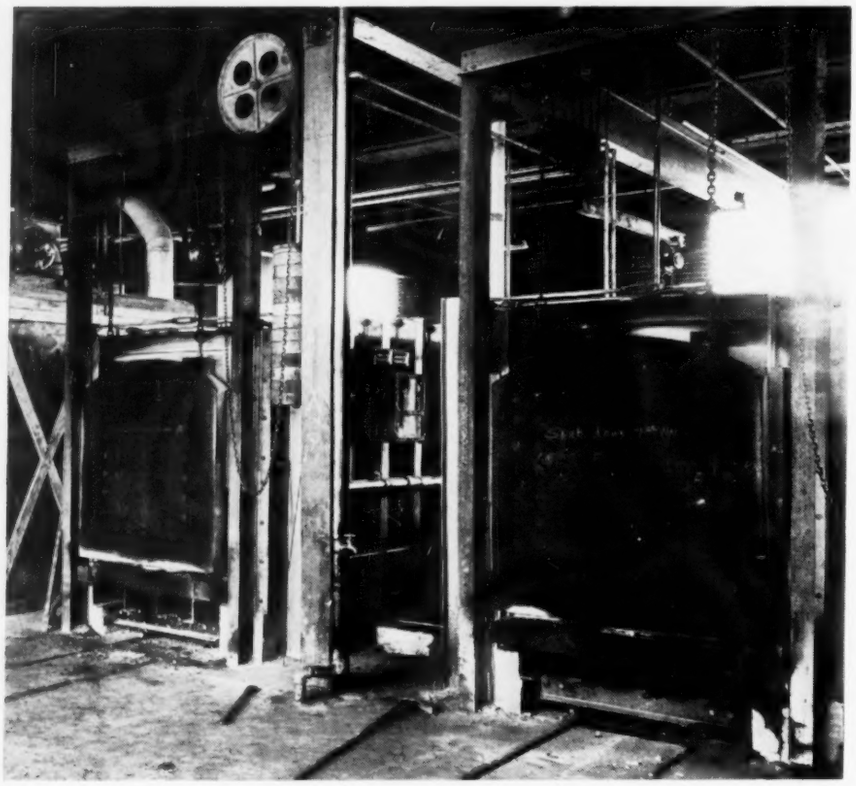
Another process for selective nitriding consists in painting the surfaces to be kept soft with a special preparation. This preparation is made up as follows: 60 parts of powdered lead is mixed with 40 parts of powdered tin and 100 parts of this powder is mixed with 15 parts of the following: 5 parts of vegetable oil (corn oil or Wesson oil); 1 part of stearine (candle grease); 4 parts of lard; 2 parts of pulverized resin; and 1¼ parts of zinc chloride. To effect good mixing, the above should be heated slightly and stirred well. After the lead-tin and oil mixtures are combined and thoroughly mixed, the preparation is diluted with gasoline to give the proper consistency for applying a smooth thin layer with a soft brush or by spraying. Care must be exercised not to have any of the paint run into the surface not to be nitrided. Excess should not be used for the same reason.

### No Hardness Test Suitable

In the nitriding process, the nitrogen penetration reaches from 0.018 to 0.020-inch. Completely satisfactory hardness tests have not been developed, but by comparing the hardness registered by the Firth diamond tester or the Rockwell superficial tester to the hardness obtained on nitralloy steels of same depth of case,

*Here are shown a variety of centrifugally cast Nitricastiron tubes, sleeves and bushings in conditions from as-cast to finish machined. These can be produced in a wide range of sizes and wall thicknesses*

a fair estimate of the hardness can be obtained. Nitrided Nitricastiron has a surface hardness of 800 to 950 Firth diamond and 70 to 80 Rockwell superficial with a 30-kilogram load. Nitralloy steels develop surface hardness of 900 to 1100 Firth diamond and 85 superficial Rockwell. The hardness of the nitrided layer of iron is effective to a depth of approximately 0.006-inch beyond which it may still be very hard and effective, but measurement is impossible because of lack of support from the base metal.



*To develop proper structure and properties, Nitricastiron must be heat treated. Here are shown the two oil-fired, car-type furnaces in which this heat treatment is accomplished by a double heating and air cooling*

It was stated previously that one of the most valuable properties of the hardened nitrided surfaces of Nitricastiron is its ability to retain its hardness at temperatures up to 950 degrees Fahr. Ordinary hardened steels and cyanided surfaces begin to fall off in hardness at temperatures in excess of 300 degrees. Examined under the microscope, the polished surface of nitrided cast iron shows many small voids or cavities which are due to the graphite and temper carbon present in the iron. These voids serve a very useful purpose, however, in that they become little reservoirs for oil and help to lower the coefficient of friction by maintaining a continuous oil film on the sliding surfaces.

The outstanding application of the centrifugally cast tubes is for liners for internal combustion engines, such as bus and truck engines and diesel engines. The tubes are cast with an allowance for finish of ⅛-inch on the outside surfaces and from ⅛ to 5/32-inch on the inside surfaces, after which the raw castings are heat treated in the manner already described, are rough machined on the outside diameter, finish machined on the inside diameter to 0.002-inch, and cut to length. The outside surface then is coated with the protecting paint and the tubes are nitrided. If nickel plating is employed, the tubes are machined as just specified, except that the inside diameter is finished 0.004-inch small; after plating, the inside diameter is ground to size, thereby removing the nickel from this surface and providing a fine finish for nitriding.

After nitriding, the outside diameters of the tubes are finished to shrink fit size and are fitted into the cylinder blocks either by chilling the tubes with dry ice and placing them in position or pushing them in place with a hydraulic ram. The amount of shrink fit which has been established as satisfactory is 0.001-inch for tubes smaller than 3-inch diameter and 0.015-inch for tubes over 3-inch diameter. After being installed in place, the tubes or sleeves are honed on the inside to produce high finish and an exact diameter. These sleeves installed in truck and bus engines have shown exceptionally high service life, have retained their original hard highly polished condition and have remained free from scratches.

Centrifugally cast nitrided tubes also are finding extensive application for cylinders of pumps handling erosive material, such as slush pumps used in well drilling. Here the application is quite simple as the degree of accuracy which must be maintained for combustion engine cylinder sleeves is not needed. The cylinder walls for slush pumps when finish machined also are heavier, so that the machining operations are simplified considerably.

Cylinders 14 inches in diameter, 12 inches long, with 1-inch wall thickness have been centrifugally cast for the capstans of wire drawing mills. The outside diameters were finish machined to the desired dimensions and after nitriding gave very hard wear resisting surfaces on which the drawn wire could slip smoothly and continuously without the formation of grooves on the capstans.

### New Uses Are Anticipated

Many new applications for centrifugally cast nitrided tubes are expected to develop as the product and its performance becomes more widely recognized. In this connection, the field of bushings holds much promise. The hardened tubes are known to be suitable for drill guide bushings, and spindle bushings for a wide range of miscellaneous applications.

Capacity of the centrifugal casting equipment in the Forging & Casting Corp. plant ranges from tubes of 1¾-inch diameter with ¼-inch as thinnest walls, to tubes 16 inches in diameter with ¾-inch as thinnest walls, and 36 inches long. With minor modifications, the equipment could be enlarged to extend the length of the larger tubes. Wall thickness on small diameter tubes should not be less than ¼-inch. Above 10-inch diameter a minimum of ⅝-inch thickness, and above 12 inches a minimum of ¾-inch wall thickness is necessary. The amount of finish for outside diameters should be at least ⅛-inch for small tubes ranging to 6-inch diameter; above 6 inches, the finish allowed should be correspondingly larger. For a tube 15 inches in diameter, at least 3/16-inch should be allowed.

Inside diameters of the tubes are controlled by accurate weighing of the molten iron to be poured into the machine. In this manner, the variation of inside diameters is held within exceedingly close limits. Minimum finish for inside diameters is ⅛-inch on a side; large tubes generally require a finish of 3/16-inch on a side which is sufficient to clean out the tube perfectly.

# TRANSPORTATION *Deals a Mighty Blow for* ECONOMY

USS HIGH TENSILE STEELS, far stronger, much more resistant to atmospheric corrosion, give transportation a powerful weapon with which to beat down the barriers to economical operation. Freight cars of great strength, designed efficiently with these High Tensile Steels, are built light so they can carry a larger pay load without added expense.

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**The atmospheric corrosion resistance of USS COR-TEN is based upon ACTUAL TESTS extending over a period of years in several different atmospheres. Our statements are based on this actual experience, rather than upon accelerated or laboratory tests.**

USS High Tensile Steels are supplied in plates, shapes, bars, strip, sheets, rods, wire and wire products, pipe and tubular products. Literature and information sent upon request.

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**USS HIGH TENSILE STEELS**

# METHODS AND MATERIALS

## Frozen Zinc in Leaky Vat Salvaged by Cutting Torch

Recently a zinc galvanizing vat developed a leak for the reason that the steel plate from which it was fabricated had become too thin to hold the weight of the zinc. The zinc froze before it could be dipped out of the leaky vat. The mass of frozen zinc weighed about 10,000 pounds, was 10 feet long and 16 inches deep over a bottom having a 15-inch radius.

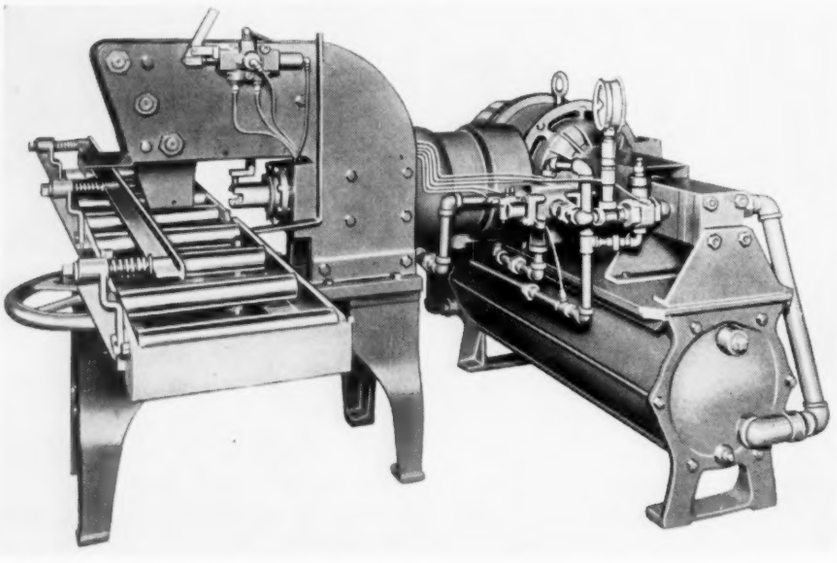
It was worth about $300 if salvaged in two pieces that could be handled for remelting but if it were to be sold as scrap it would have been worth only about $50. A local contractor offered to drill it apart for $75. The job finally was accomplished satisfactorily by the aid of the oxyacetylene cutting torch, at a total expense of about $20.

First a section approximately 6 inches wide was cut cross-wise from the bottom of the steel vat. Then a welding torch was employed for cutting the zinc. The cut was made about 1 inch wide to permit the torch tip and extension to extend into the cut. A piece of ½-inch round iron flattened on one end and with about 4 inches bent to a right angle was used to scrape the zinc oxide from the cut as it formed as it was found that cutting and melting of the zinc was retarded greatly when the zinc oxide was allowed to cool. This part of the operation was performed by helpers without stopping or removing the torch from the cut. By letting the bottom of the cut lead into the body of zinc the molten zinc ran out freely. This prevented excessive fuming as zinc does not throw off excessive fumes unless confined.

The zinc fumes produced were carried away by a large electric fan. A respirator was needed only when cutting the steel strip from the bottom of the vat.

Four hours were required for carrying out this operation which consumed 300 cubic feet of oxygen and 200 cubic feet of acetylene and involved a total expense of about 20 dollars.

## Airless Rivet Press



*HYDRAULIC POWER FOR RIVETER: Here is a special 50-ton hydraulic riveting press recently installed in the plant of a prominent tractor manufacturer for heading several rows of ¾-inch hot rivets on track frames for crawler-type tractors. Work is advanced between the dies on a roller bearing conveyor, adjustable vertically to bring rivets into line with the dies. Movement of a lever starts the riveting cycle which is automatic: The ram advances first, actuating a pressure pad, and continued movement heads the rivet; after momentary dwell on the rivet under full pressure the ram reverses and when at rest the hydraulic system idles at no pressure. Maximum working pressure is 1600 pounds per square inch; maximum ram travel is 5½ inches. Power is supplied through a 10-horsepower motor. The unit was built by Hannifin Mfg. Co., Chicago, which is reported also to have developed a portable yoke-type hydraulic riveter*

$ $ $

## More High Chromium Steel Castings Are Being Used

Considerable increase in the utilization of the high chromium steels in the form of castings is noted. Since the development of high nitrogen ferrochromium for introducing nitrogen into these steels, thereby causing considerable grain refinement and increase of impact strength, their field has widened considerably. The nitrogen also has the effect of reducing the tendency toward excessive grain growth when the steel is held at high temperatures for a considerable period.

$ $ $

## Builds Electric Oven To Heat Turbine Casing Bolts

Turbine casing bolts are heated before putting them in place. In one plant, the practice had been to heat

# Announcing.....

## A Radically New Limit Switch

## with 8 Important Advantages

Costs only $6.00

THERE are dozens of jobs that this new, low-priced limit switch can do for you. It supplies a simple and convenient means of interlocking mechanical motion with electric control circuits for making processes automatic, operating safety devices, etc. Put it to work on your machines and watch it save money.

Check these big advantages of the new G-E limit switch:

1. ***Two separate circuits,*** one normally open and one normally closed, make it suitable for a wide variety of applications.
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the bolts with a gas torch. One man held a bolt while another operated the torch; two other men put the bolt in place while the next bolt was being heated. This job was simplified by building a small electric preheating oven which is provided with 18 strip heaters and maintains a temperature of 500 degrees Fahr. Now, two men are able to do the entire job because this conveniently located, portable oven preheats the bolts over night and eliminates delay the next day. Furthermore, all bolts are uniformly heated.

S S S

## Small Vessels Installing Monel Metal Shafts

In the field of small craft, such as coast guard patrol boats, lighthouse tenders, yachts and speed boats, the use of monel metal for propeller shafting increased substantially during 1934. Of special interest in this respect is the expanding use of monel metal in the fishing fleets for hold linings as well as for shafts. Due to the service given by a shaft of this type which was put into one boat several years ago, almost the entire fleet of crab boats serving San Francisco was equipped with monel metal shafts during this last year.

S S S

## Bronze Welding Reclaims Large Cast Iron Gear

A large cast gray iron gear on a 200-ton double-acting press used for forming the heads of steel drums failed recently, the breaks occurring in five different sections adjacent to the point of maximum load. This gear was 6 feet in diameter, had a 9-inch face and weighed 2000 pounds; to replace it would have cost several hundred dollars and entailed a delay of at least six weeks. In view of this situation, bronze welding was tried as a repair. Chipping out the fractures in preparation for welding took about 8 hours, because of the five bad breaks; the gear was then preheated, and bronze welded. About a month after the repair was made, an inspection showed the gear to be in good condition.

# Steel Dam Faces Consume Large Plate Tonnages—Institute Fosters Trend

AN INCREASING use for steel plates, novel in several of its features, is arising from the steel-facing of earth and gravel-filled dams. With a considerable number of these two types of dam both being built and contemplated at the present time under federal public works programs, steel plate producers foresee the possibility of more facings of this nature being specified as protection to the earth dam's upstream surface.

At least two prominent installations of this nature have already been made, one the Penrose-Rosemont dam for the Broadmoor Hotel Water & Power Co., Colorado Springs, Colo., which has taken about 600 tons of plates. The other, now being completed, involves the use of about 1000 tons of plates at the El Vado dam for the Middle Rio Grande Conservancy district, New Mexico. At least two others are now under construction.

### Use Copper-Bearing Steel

Steel facing, using $\frac{1}{4}$ and $\frac{3}{8}$-inch plate for the most part, is copper bearing carbon steel and usual plate section sizes around 8 x 20 foot dimensions are employed. Plates so far used are practically all in flat sections with the bottom units anchored in concrete at the dam's base; then with the successive build-up of additional plates to a height of as much as 170 feet in the case of the El Vado dam, the completed face has the double effect of being water tight and a lasting protection against earth and gravel erosion.

This type of plate wall is welded both horizontally and vertically in the field, allowances being made for vertical expansion joints. Preliminary to welding, however, the plate sections are temporarily bolted into place. Concrete sealing is then poured at the ends of the dam. In the case of the Penrose-Rosemont dam the original dam had an upstream face wall of rubble masonry to which the steel plates are securely anchored.

The Penrose-Rosemont dam, views of which accompany, has a maximum

*A fabricated steel plate face, shown at right, protects the new Penrose Rosemont dam, erected for the Broadmoor Hotel Power & Water Co., Colorado Springs, Colo., by the American Bridge Co.*

*At left view of south end of dam, looking downward, showing facing plates at this point completely erected and concrete sealing poured*

height of 100 feet and a crest length of 580 feet. The El Vado dam, however, is 170 feet high maximum and has a crest length measuring 1200 feet.

The trend toward increasing adoption of steel as the material of construction in dams is being accelerated by the work being done by the American Institute of Steel Construction, 200 Madison avenue, New York. Data on this subject in the possession of the institute have been turned over to Dr. O. E. Hovey, consulting engineer, New York, who is preparing a work on fixed steel dams to be published by the institute. Dr. Hovey formerly was identified with the American Bridge Co. as assistant chief engineer, and also lectured on bridges over a number of years at classes in Yale and Princeton universities.

## New Luminous Paint Shows Location of Objects in Dark

A new luminescent paint known as Dialux has been developed by Dr. E. A. Grobet, chemical engineer, Grobet File Corp. of America, 3 Park place, New York city. Its principal element is sulphide of calcium, a phosphorescent salt which, after exposure to natural or artificial light for a short space of time, gives off, in the dark, a luminosity. The new paint, it is stated, is a permanent accumulator of light, and may be recharged with light indefinitely. It can be applied to metal, glass, wood or any other materials, either by brush or air gun. Its chief value is said to consist in indicating the position of objects in complete darkness.

## Will Exhibit Metal Products Which Have Eye Appeal

The industrial arts exposition, sponsored by the National Alliance of Art and Industry, is to be held April 15 to May 15 in the huge forum at Rockefeller Center, 30 Rockefeller plaza, New York. Many of the exhibits will show steel and other metal products designed for eye appeal.

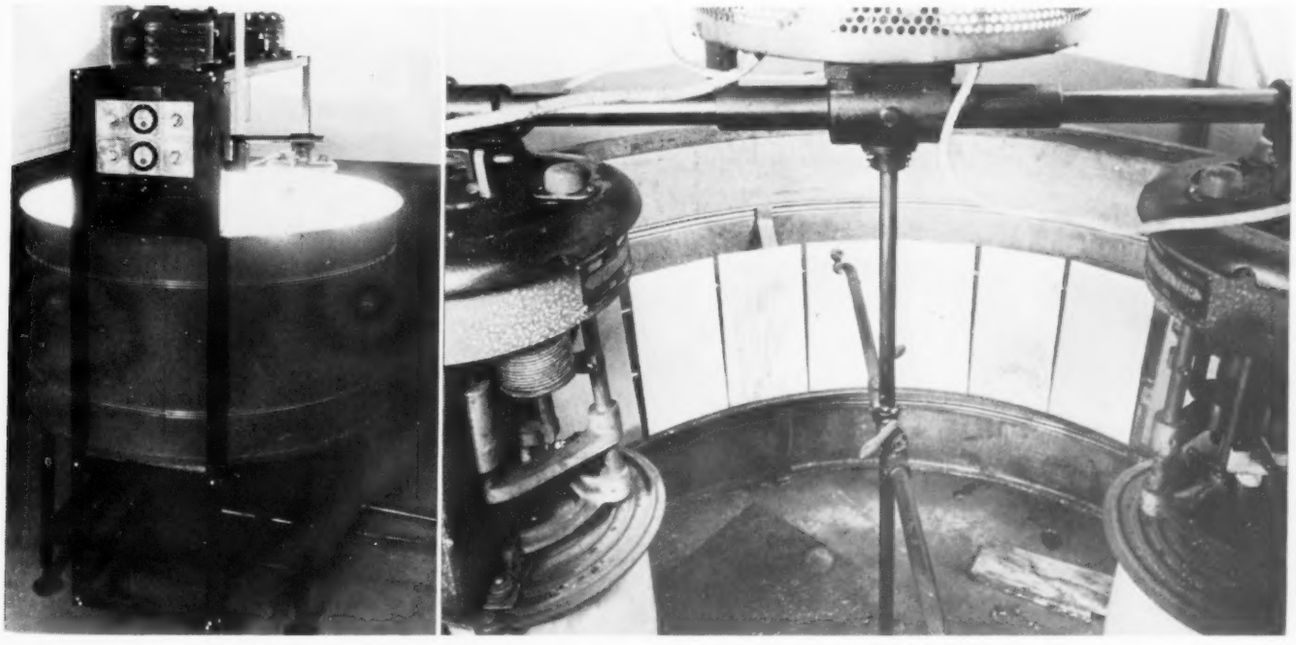
The plan of the exposition, being executed by Thomas J. Maloney, 386 Fourth avenue, New York, is based on requirements of the average man, including housing, home appliances, transportation, communication and leisure.

Richard De Wolfe Brixey, president of the Kerite Cable Co., New York, is president of the National Alliance of Art and Industry. Among its directors are E. Tappan Stannard, president of Kennecott Copper Corp., New York; James L. Rodgers, president of Toledo Synthetic Products Co., Toledo O., and Ben Nash, industrial designer, New York.

Included in the membership of the committee in charge of the exposition are Hubert D. Bennett, Toledo Scale Co., Toledo; Allan Brown, Bakelite Corp., Bound Brook, N. J.; Edward G. Budd, Edward G. Budd Mfg. Co., Philadelphia; Rodney Chase, Chase Brass & Copper Co., Waterbury, Conn.; C. R. Gardinor, International Silver Co., Meriden, Conn.; T. M. Girdler, Republic Steel Corp., Cleveland; Charles J. Hardy, American Car & Foundry Co., New York; William J. Priestley, Union Carbide & Carbon Corp., New York; T. K. Quinn, General Electric Co., New York; and Robert C. Stanley, International Nickel Co., New York.

# Accelerated Testing Device Determines Protective Value of Coating on Steel

FOR testing a new penetrating primer coating developed by Truscon Laboratories, Detroit, for application to rusted steel surfaces, that company made use of a novel device known as the Weather-O-Meter. By means of this device, shown in the accompanying illustrations, paint and other coatings on steel panels are given accelerated tests equivalent to an outside weather exposure of 1½ to 2 years. These tests revealed that the new penetrating primer, because of its characteristic of rendering rust dormant and preventing it from spreading further, gives practically indefinite protection to rusted surfaces.



*In this novel machine, coated steel panels alternately are doused with cold water and dried and heated once every 7½ minutes, giving the effect of continual change from wet to dry, sunshine to shadow, hot to cold, with accompanying expansion and contraction of the surface. The special grade of carbon in the arc light gives off ultra violet rays in unusual quantities. Interior view of machine is shown at right*

# What's your load . . . . ,

## *is it*

## 300 lbs. *or*

# 30,000 lbs.

# ?

**Yale has the equipment to handle it easily, safely and economically**

THE addition of two important new products makes the Yale line even more comprehensive than ever.

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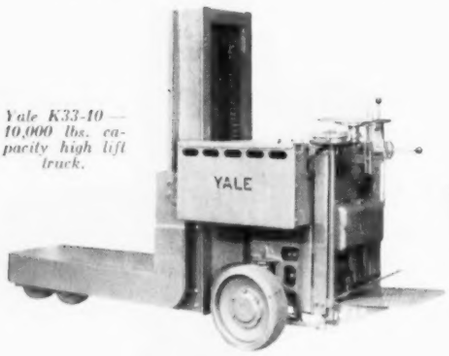
Second, the "Lockweld" Skid Platform—a heavy duty, oak top, truss construction, steel-bound skid platform.

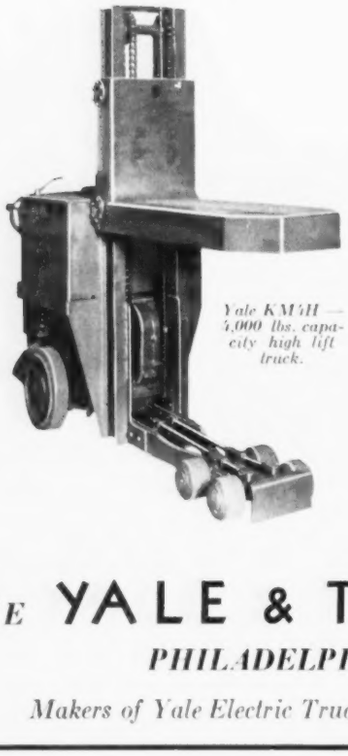
The Lockweld was designed to meet the requirements for heavier loads. It has longer life and minimum depreciation. Built for the user of skid platforms who wants the finest job available.

Yale handling equipment, made in capacities from 300 to 30,000 lbs. is available in a wide range of types, models and sizes.

This equipment embodies the notable mechanical developments for which all Yale products are distinguished.

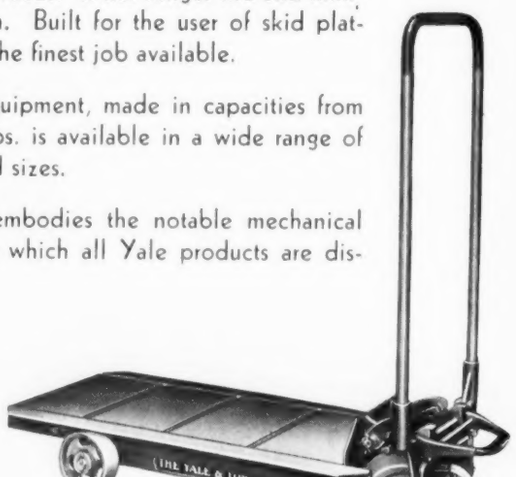



*Yale K33-40 — 10,000 lbs. capacity high lift truck.*



*Yale KM5H — 4,000 lbs. capacity high lift truck.*

*Yale Multi-Stroke Hand Lift Truck — capacities up to 20,000 lbs.*




*The new "Zephyr" Hand Lift Truck — capacities up to 1,000 lbs.*

*These new additions completely round out the Yale line of materials handling equipment.*

*The new "Lockweld" Skid Platform — capacities up to 30,000 lbs.*

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*Let us survey your plant*

## *THE* YALE & TOWNE *MANUFACTURING COMPANY*

***PHILADELPHIA DIVISION***, PHILADELPHIA, PA., U. S. A.

*Makers of Yale Electric Trucks, Hand Lift Trucks, Hand Chain Hoists, Electric Hoists and Trolleys*

The new primer was developed to fill the need for a coating which may be used for protecting surfaces of tanks and other outdoor steel structures from which it usually is impossible, or not practical to remove rust.

**Placed on Revolving Rack**

In this testing device the coated panels are placed on a circular rack, while inside the circle is a revolving member on which two electric arc lights and a cold water spraying nozzle are mounted. This member travels slowly, making one revolution each 15 minutes. The spray thoroughly douses and chills each panel twice during each revolution. Then the light comes along, dries the panel, heats it and exposes it to ultra violet rays. The lights are provided with a special type of carbon which throws off ultra violet rays in unusual quantities. As each light arrives in front of a panel it is only 6 inches distant from the surface being tested, thus being equivalent to light more powerful than ordinary sunlight.

The device thus gives the effect of continual change, alternate wetting and drying, sunshine and shadow, heat and cold, expansion and contraction of the surface, and the concentrated effect of the ultra violet rays of sunlight.

## Steel Compression Test Data Set Forth in New Report

"Compression Tests of Structural Steel at Elevated Temperatures" by Prentiss D. Sale, is the title of a new book published as research paper RP741 of the national bureau of standards and obtainable from the superintendent of documents, Washington, at 5 cents per copy. Strength in compression and stress-strain relations are given for structural steel shapes and round bars at temperatures up to 1733 degrees Fahr., the slenderness ratio for the bars being in the general range of 20 to 150. One group of tests with cast iron specimens is included for comparative purposes. Two general methods of testing are included, one in which the specimen is heated to a given temperature and then loaded to failure and the other in which the load is maintained constant and the temperature increased until failure occurs. The results are given in tables and graphs.

For structural steel tested at temperatures of 482 degrees Fahr. or higher and for cast iron at all temperatures, no well defined yield point or yield region was developed. A strength higher than that obtained at room temperature was developed at temperatures near 482 degrees Fahr. in all tests except in those with the light angle, pressed steel, and cast iron sections and with round bars of smaller diameter than ¾-inch.

## Measuring Metal Hardness: A Critical Study of Tests

*Hardness of Metals and Its Measurement*, by Hugh O'Neill, cloth, 6¼ x 9½ inches; supplied by STEEL, Cleveland, for $8, plus 15 cents for postage; in Europe by Penton Publishing Co. Ltd., Caxton House, Westminster, London.

Although the property of hardness is rather indefinite, so-called hardness tests have become of great importance in the theoretical study and practical examination and control of metals and alloys. This volume describes and sums up recent ideas from the point of view of the practical as well as that of the academic worker.

In recognition of a considerable body of literature on hardness and its relation to metallography a large alphabetical list of references is included. Hardness has been interpreted in the widest sense and as a result it has been considered legitimate to include observations on the deformation of metals by tension and compression, as well as by indentation. Thus the volume becomes is some respects a critical study of the mechanical technology of metals and alloys from the hardness viewpoint.

The chapters cover features of some static indentation tests, the static ball test, typical apparatus for static and dynamic indentation tests, hardness and its relation to deformation and strain-hardening, crystallinity of metals, alloy and heat treating in relation to hardness, tests of soft and hot metals, preparation and examination of the specimen, abrasion, machinability and cutting hardness. In an appendix a table is given for conversion of various common hardness scales from one to the other.

## Stabilization of Stainless Improves Weld Resistance

Tests of specimens consisting of two pieces of stainless steel joined by spot welding, gas welding and soft soldering show, on the whole, improved resistance of the joints to corrosion when the steel has been stabilized, according to H. S. Rawdon, chief of the metallurgical division, national bureau of standards, Washington.

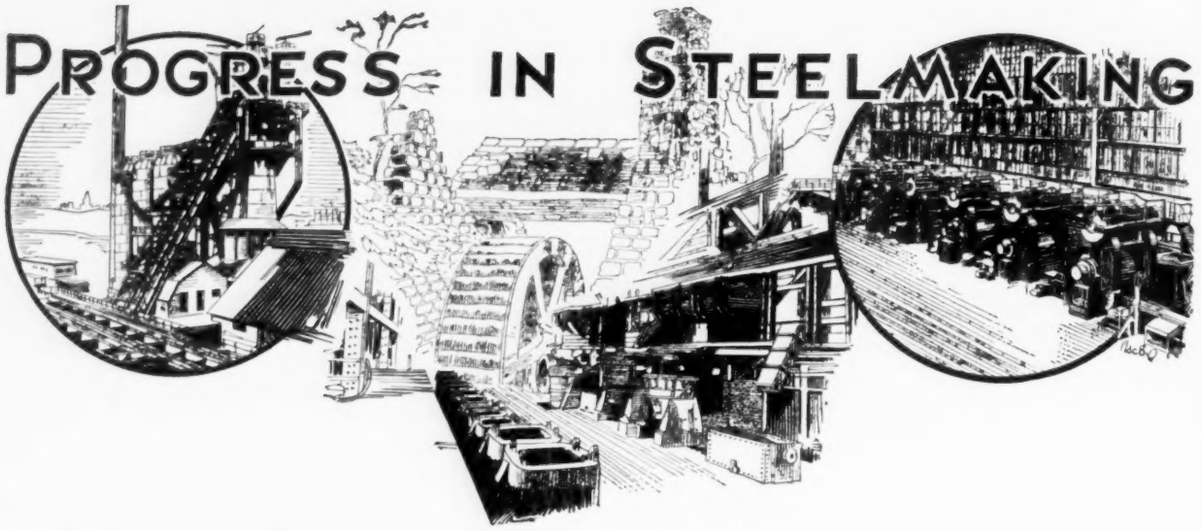
These conclusions are based on some routine corrosion tests of jointed specimens of 18-8 chrome-nickel stainless steel, using the bureau's standard salt spray. The tests were of 500 hours' duration and the specimens were exposed to a fog of a 20 per cent sodium chloride solution maintained at temperature of 95 degrees Fahr.

Apparently neither spot welding nor soft soldering caused carbide precipitation in the structure of either the stabilized or the unstabilized material, it was stated.

Some grain boundary carbides were detected at the edge of gas welds in stabilized material but not at any appreciable distance from the weld. In gas-welded unstabilized material, carbide preciptation at a considerable distance from the weld was formed, according to information in the report.

## Breakfast Set De Luxe

**STAINLESS STEEL SET EXHIBITED AT METROPOLITAN MUSEUM: The hollow-ware and flatware in this table display at the Industrial Arts Exhibit of the Metropolitan Museum of Art, New York, are stainless steel. Nontarnishing and of pleasing appearance, this metal lends itself readily to modern design. The use of stainless steel in these articles was made possible through cooperation of Electro Metallurgical Co.**




## How Spalling Is Prevented

Cement floors and aisles in various steel plant departments frequently crumble under heavy trucking. These may be transformed into a granite-like substance, which will take on a polished appearance of flint, by treating them with magnesium fluosilicate. The surface must be free from oil, grease and paint before applying the liquid which is made by dissolving 2½ pounds of magnesium silico-fluoride in 1 gallon of hot or cold water. The first application should consist of one part of the solution and two parts water; the second, one to one; and the third, the straight solution. The chemical, which can be obtained from chemical supply houses, not only hardens, wearproofs and dustproofs the surface of the cement but fills the pores and thus reduces the porosity. Floors or walkways thus treated may be enameled or painted with an oil paint.

• • •

## Plans to Restore Old Stone Stack

*BLAST FURNACE PRACTICE OF YESTERYEAR—Purchase of 80 acres surrounding the site of the oldtime charcoal stone blast furnace, known as the Buckeye furnace in Jackson county near Wellston, O., has been completed. The property is being turned over to the Ohio Archaeological and Historical society, Columbus, O., which will convert it into a state park. The ultimate purpose of the society is to include the purchase of additional acreage and completely restore the old stone stack to its original working order. The stack, 40 x 10 feet, was built in 1851 and had an annual capacity of 4000 net tons*

## Gas Piped Through Plant

At an Ohio steel plant an acetylene generator and pipe lines supply the acetylene to the welder's shop. The open-hearth department is piped with an oxygen line from a central manifold station to facilitate furnace tapping and welding. A connection is provided between the furnaces from the main oxygen line for furnace tapping; several connections are provided in the welding shop for welding and cutting.

• • •

## Markets New Type Fitting

Explosion-proof condulets, which have the mechanical features of standard flexible conduits in its ease of application, recently were placed on the market. The fittings are especially applicable at coke plant by-product departments where dust and vapors create a hazardous condition.

• • •

## Reduces Cost of Pickling

Rods coming from the finishing stand of a continuous mill in the Chicago district at about 1800 degrees Fahr. pass into a scaler through which about 5000 gallons of water at 55 degrees Fahr. flows an hour. The rods are cooled sufficiently to form a scale of about 0.5 per cent of their weight. In the summer when the temperature of the water is 65 degrees Fahr. about 1000 gallons more water is required to give

the same effect. This arrangement affords a 2 per cent saving in steel and a reduction in cleaning acid costs.

• • •

## Employs Hydraulic Brakes

Bridge motion of overhead traveling cranes now is checked by a recently designed etxernal hydraulic brake built with conventional type shoes. Advantages claimed for this type brake are ease of operation, low maintenance cost, adaptability for single or multiple units, with one source of operation and equal braking effect on all wheels. The latter feature is useful on double drives such as employed on ore bridges.

• • •

## Anneals with Methanol Gas

Wire now is being annealed in an atmosphere of methanol gas which changes the surface smut to amorphous carbon. This need not be cleaned from the surface inasmuch as it serves as a lubricant in the next pass through the dies.

• • •

## Breakage Is Curtailed

Steel feet welded to the frames of motors serving drop forging hammers have been found to curtail breakage.

• • •

## Provides Means of Safety

An elevated walkway at a recently completed pipe mill affords observation of all operations and obviates the necessity of having to walk around the mill or over the tables in getting from one department to another.

• • •

## Minimizes Cost of Current

Nearly 60 per cent in the cost of current for heat treating is saved by the use of a new method of electric annealing which takes advantage of the gradual decrease in temperature by successively annealing different metals at lower temperatures. The process, which utilizes relatively low-cost off-peak electric energy, is suitable for annealing sheets, strip, tubes and wire. Annealing costs using a furnace with a capacity for heating 1 ton an hour amount to $2.80 per ton of metal treated.

# Roll Neck Bearings Are Rejuvenated In Special Oil Bath Furnace

CONSTANT heavy-duty service induces work hardening strains which if allowed to develop without relief will cause premature steel failure. Roll neck bearings in particular must carry such strains, and the Timken Roller Bearing Co., Canton, O., has made a special study of the situation. This involved practical and metallurgical aspects.

It is impossible to say how often a roll neck bearing should be treated, for that depends upon the character of work and the continuity. However, when mills are in practically continuous service, it has been found advisable to draw the bearings about every three months. For intermittent service, a six months interval may prove suitable.

The Timken company has issued the following recommendations for drawing their roll neck bearings in a special oil bath furnace design for the purpose by the Salem Engineering Co., Salem, O.:

TEMPERATURE:

Maximum bearing temperature, 350 degrees Fahr.

Minimum bearing temperature 325 degrees Fahr.

HEATING TIME:

Minimum time at temperature two hours per inch of maximum cross section of any component part of a bearing.

FREQUENCY OF TREATMENT:

Three to six months.

GRADE OF OIL USED IN FURNACE:

Neutral paraffin, 28 to 29 degrees Baume; viscosity, 100 seconds at 100 degrees Fahr.; flash point, 375 degrees Fahr.; fire point, 425 degrees Fahr.

ELECTRIC POWER REQUIRED:

Depends upon the size and quantity of bearings treated. The following figures are taken from a 15-day test drawing 153 tons of Timken bearings in an oil-draw furnace, 66 inches diameter with an effective loading depth of 37 inches.

Total connected load, 25 kilovolt amperes.

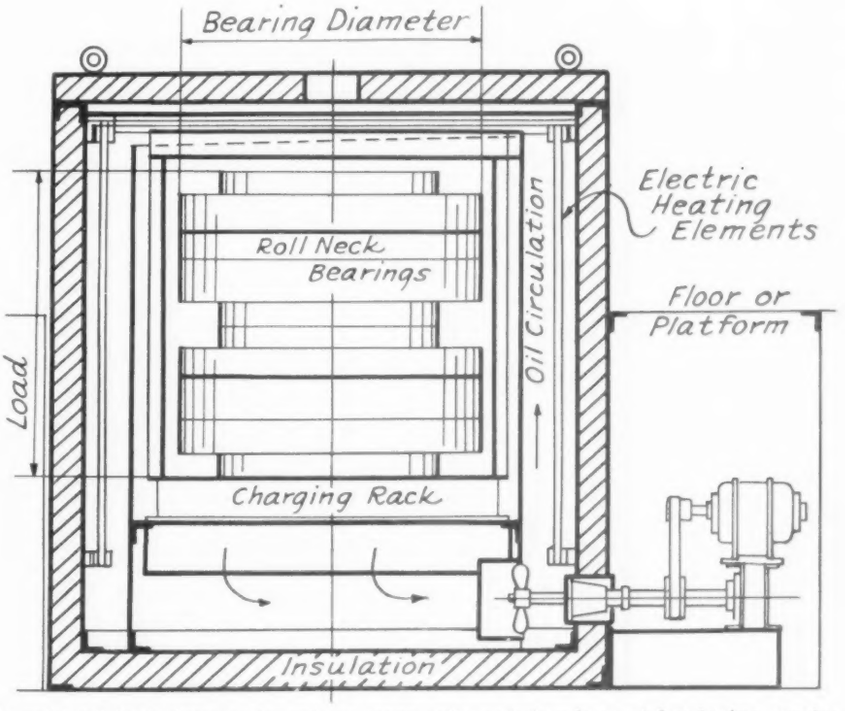
Standby radiation loss of furnace at 350 degrees Fahr., 7 kilowatts an hour.

Average kilowatt hour per ton of bearings drawn was 55.

Time required to heat furnace from cold to 350 degrees Fahr., 12 hours.

Automatic temperature control employed.

Entirely satisfactory results have been secured by loading roll neck bearings in such an oil draw furnace in pairs, as indicated in the accompanying drawing, Fig. 1. Smaller bearings may be treated at the same time by placing them in baskets or on supports inside the bore of the larger bearings. Experience has shown that it is satisfactory to draw Timken bearings as complete assemblies. This equipment can be used with equal success for drawing gears, rolls, pinions, and other pieces of equipment which work-harden in use, and which can be rejuvenated.




*Special oil bath furnace to relieve large roll neck bearings of hardening strains*

Additions of Nickel greatly improve the properties of cast iron. They render it more dependable, more suitable for use in modern equipment of every kind.

Among the many types of Nickel Iron castings that are being used to-day with success and economy are: Internal combustion cylinder blocks, heads, liners and pistons; locomotive cylinders and parts; gears; cams; machine tool equipment; pump bodies, valves and parts; compressor parts; steel mill rolls; grinding, crushing and sizing equipment; plow points and mold boards, etc.

Over a period of years an extensive fund of data has been compiled on the experience of numerous users who have successfully applied Nickel Cast Irons. This information as well as the services of our casting specialists are always available to you.

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# SECOND STAINLESS STEEL STREAMLINE TRAIN IS PLACED IN SERVICE

NEW Flying Yankee, so-called to differentiate it from the steam operated Flying Yankee, built by the Edward G. Budd Mfg. Co., Philadelphia, for the Boston & Maine and Maine Central railroads, went on its trial run Feb. 5. In a snowstorm, on a run from Philadelphia to West Trenton, N. J., it developed its guaranteed speed of 100 miles per hour. It is the first diesel-electric, light-weight, streamlined, articulated, stainless steel train to be delivered to any Eastern railroad and the second in the country, the initial unit of this type being the Burlington's Zephyr.

After an exhibition tour in New England and test runs in regular operation over the two roads, the train will be placed in service between Boston and Bangor, Me. Plans call for a daily run from Portland, Me., to Boston, a round trip from Boston to Bangor and an evening run from Boston to Portland, a daily travel of nearly 700 miles.

**Other Companies Cooperated**

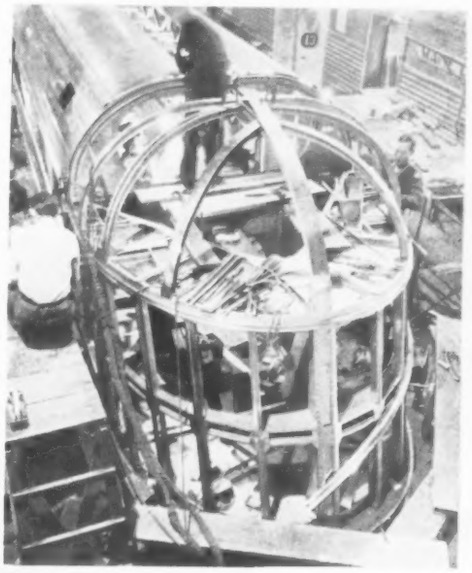
Co-operating with the Budd company was the Winton Engine Corp., Cleveland, a division of General Motors, which built the 600-horsepower diesel electric engine that furnishes the motive power. Air conditioning was supplied by the Frigidaire Corp., Dayton, O., and electrical equipment by General Electric Co., Schenectady, N. Y. Interiors were designed by the art and color section of General Motors Corp. The engine bed was fabricated by Lukenweld Inc., Coatesville, Pa. General Steel Castings Corp., Eddystone, Pa., supplied the cast steel truck frames and bolsters. Journal bearings were supplied by the Hyatt Roller Bearing Co., Harrison, N. J. The stainless steel, of the 18-8, chrome-nickel type, was furnished by the Allegheny Steel Co., Brackenridge, Pa., and by subsidiaries of the United States Steel Corp. The air compressor was furnished by the Gardner-Denver Co., Denver, Colo.

The Flying Yankee is 9¼ inches short of 200 feet in length. It is an articulated unit of three sections carried on four trucks. The rear end of the forward section and the front end of the middle section rest on a common truck while there is a similar arrangement between the rear section and the rear end of the middle section. The sections are joined together by a pivot so that there is no jostling or bumping when the train takes a curve or comes to a stop. The outside surface of the train is preserved unbroken by the use, between the sections, of flexible diaphrams that are compressed or extended like an accordion, by doorsteps that fold up when the train is in motion and by windows flush with the sides.

The forward section, in addition to carrying the engine, compressor and other mechanical equipment, has a baggage compartment, buffet and accommodations for 28 passengers. In the second section there are two compartments, one with 24 seats and the other with 36. The rear section has a compartment with accommodations for 36 passengers and an observation lounge with 20 armchairs. There are accommodations for a total of 144 persons.

Interiors are finished in light-weight pressed wood, and are in pleasing color schemes with a polished stainless steel molding running the entire length of each compartment above and below the windows. The window shades, which have an aluminum finish on the outside to match closely the bright stainless steel exterior of the train are, on the inside, of a neutral pattern which harmonizes with the color schemes of the interior. In the lounge, or solarium, are upholstered chairs, while in the other passenger compartments the seats have light-weight tubular aluminum frames. Seats are fitted to take serving trays. Robe rails for overcoats are provided on the seat backs. Lighting is indirect, the lights being concealed in a cove

*NEW FLYING YANKEE, country's second stainless steel, streamline train is shown below. Details of design and construction of the front end are shown at right*



below the ceiling along each side. In addition to being air-conditioned, the train is thoroughly insulated both for heat and sound.

Builders of the Flying Yankee stress the importance of the quick acceleration and deceleration of this train, aside from its high speed. If a train such as the Flying Yankee and a conventional limited steam train start simultaneously, they say, the Flying Yankee will be six miles ahead by the time both have attained 90 miles an hour. And there is a corresponding saving of time in decelerating the speed and coming to a stop.

### Streamlining Helps Speed

Stream-lining is regarded as an important factor in that tests indicated that at 95 miles an hour the resistance to motion was reduced to about 47 per cent of that of a train of equal weight and size but of conventional shape. Of greater importance in the operating results, say the builders, is the light weight made possible by the stainless steel construction. The entire Flying Yankee, for instance, weighs 212,000 pounds including the power plant, which accounts for about half the weight.

In its structure this train, as was also true of the Burlington's Zephyr, is a complete departure from conventional design. To a very large extent the entire body structure from floor to roof performs load-carrying functions. The characteristic truss form of construction adopted by the Budd company for the utilization of built-up sections of thin gage stainless steel is used.

The main members of the car bodies are the Pratt truss side frames which have, in effect, been carried up to the roof by the use of diagonals in wide deadlights between the windows and the roof which forms the top chord. The truss members are generally of flanged box sections formed of deep flanged channels and cover plates joined by the shot weld system.

The floor structure is made up of a corrugated sheet of stainless steel, the bottoms of the rectangular corrugations of which are welded to a flat sheet and both in turn welded to the longitudinal stringers, of which there are 10 across the car. These, in turn, are secured to transverse supports built into the car frame. The floor thus forms a stiff horizontal girder through which end loads are distributed to the side girders. The roof constitutes a primary structural member assuming the entire compression load. It is built up of longitudinal corrugated sheets welded to roof carlines and is locally reinforced at points of maximum stress. The roof-sheet corrugations are $\frac{7}{16}$-inch deep with a pitch of $1\frac{1}{2}$ inch.

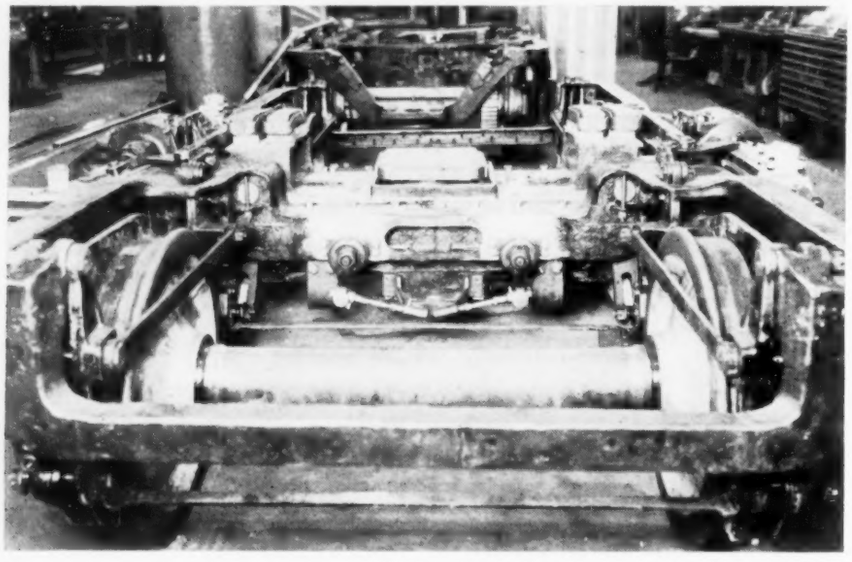
In cross-section the car assumes something of tubular form. The enclosure below the floor, however, is of only incidental value as a part of the load carrying structure except at the baggage doorway, where it is reinforced to serve much the same purpose as the roof. At the passenger entrance doorways there are longitudinal trusses to assist in resisting torsion at these points.

Among the special features in the structure which are of particular interest are the engine bed and the method of tying the articulation castings into the framing of the coach bodies. The engine bed is a rigid arc-welded structure of steel plate, annealed after completion of the welding. It forms a combination bumper, engine bed and bolster and is 26 feet $5\frac{1}{4}$ inches long by 8 feet 8 inches wide. The material is cromansil steel made by the Lukens Steel Co., Coatesville, Pa. The completed structure weighs 6813 pounds. It is built into the lower chord member of the side trusses and forms the foundation for the nose structure of the car. The nose construction consists of a deep, stiff member which extends diagonally outward and downward on the longitudinal center plant of the car from the roof to the bumper portion of the engine bed. This is reinforced with a stiff horizontal arch at the belt rail and with a diaphragm which forms the bottom of the engine-cooling air-intake chamber above the cab windows. This diaphragm consists primarily of two horizontal beams sloping back from the central collision post diagonally to the upper side structure rail. A tie bar across the car resists the spreading action resulting from a blow on this collision beam. These horizontal beams also serve as the top support for the intermediate posts around this end, all of which are reinforced for maximum collision protection.

### Most Joints are Welded

Each articulated casting is tied into the body by riveting to the end posts and frame and also to a cromansil reinforcement at the end of the center sill. No rivets other than those connecting end sill castings, engine beds, needle beams and the rear bolster beam to the side frame are used in the car structure. The transverse horizontal arms of the castings extend out only far enough to carry the side bearings, and the load is carried to the side frames through the end truss structure with a considerable saving in weight. Through the stiff end structure the reaction from the weight on the truck center is carried to the main side frames. The bending moment due to the eccentric loading at the articulation center pins is distributed to the center sill and the vertical end post. The end posts are built up of $\frac{1}{8}$-inch stainless steel plates and are 12 inches deep.

Incorporated in the engine are several novel features of construction and design. For example, engine weight has been reduced to about 22 pounds per horsepower by the use of arc welded steel plate to form a single-piece engine block, comprising the crankcase and cylinder block, to which a light oil pan is attached. A 9-bearing crankshaft is carried on main bearing seats fastened to the end of individual cross members cut to form frames for the fabricated engine block. In this manner combustion stresses are transmitted directly to the bearing seats, through the solid frames held rigid by the various patterns of welded plate, which form the air-intake passages, and other parts.



*One of the articulated trucks of the New Flying Yankee, showing brake construction, shock absorbers, bolster pad, wheels, axle and other details*

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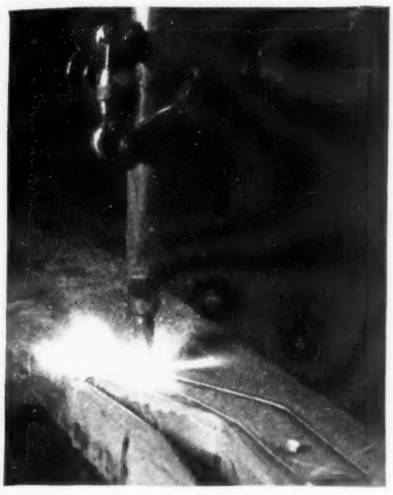
# *Linde Process Service*



• *Pinion gears, connecting links, reach blocks, pall levers and dipper teeth are shape-cut from strong alloy steels in routine operations. These dipper teeth are being accurately formed from alloy steel stock.*

## WIDENS USEFULNESS OF OXY-ACETYLENE MACHINE CUTTING

RECENTLY a power shovel manufacturer reported how Linde Process Service helped perfect a series of complicated flame-cutting operations:

"We started to use oxy-acetylene shape-cutting several years ago—at first, only for dipper teeth. Later we used it on many other parts for which the strength of rolled or forged steel was desirable.

"On these parts oxy-acetylene cutting proved so profitable that we asked Linde to help us develop accurate shape-cutting of our heaviest parts from slabs and ingots.

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"Now, we have replaced nine machines with two shape-cutting machines. We are cutting heavy steel to tolerances of 1/32-in. and less. We shape-cut parts accurately from steel 20 in. thick. Angle corners and curved cuts are simple for us."

By translating proved methods into terms of actual plant requirements Linde Process Service helped organize these shape-cutting operations for greatest speed, economy and dependability. It can probably help you in similar work. Ask the nearest Linde Sales Office to show you how.

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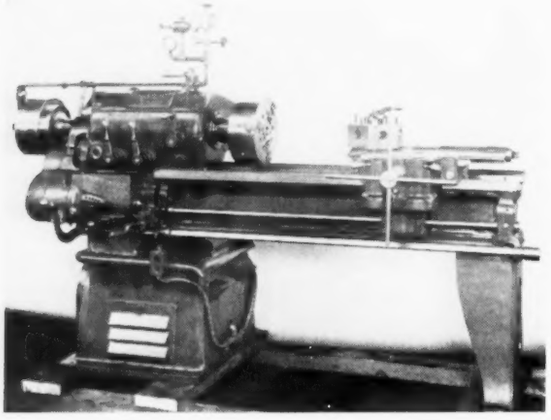
# NEW EQUIPMENT

PRODUCTION FABRICATION
TREATMENT FINISHING

### Turret Lathe—

Reed Prentice Corp. Worcester, Mass., has developed a 14-inch by 6-foot 8-speed sliding gear head production type turret lathe. Construction of this unit, shown herewith, embodies a standard 8-speed sliding gear headstock with self-contained cabinet leg motor drive and quick change gear mechanism for feeds only. Machine is equipped with power feed bed turret which incorporates both forward and reverse feeds for drilling and reaming operations in cast iron mostly. The work is held in 12-inch 3-jaw steel body combination air chuck operated through 10-inch rotating double acting cylinder with reducing valve and automatic lubrication unit.



*Left—Production type turret lathe developed by Reed Prentice Corp.*

*Right—Niagara heavy-duty press embodies a one-piece cast frame*

• • •

### Automatic Drilling Unit—

Bradford Machine Tool Co., 657 Evans street, Cincinnati, has brought out a unit for use in building up special high production equipment for drilling, tapping, reaming, spotfacing and hollow-milling. It is a high-speed sensitive unit with a capacity up to ½-inch drill.

Totally enclosed, the unit runs in oil with a splash lubricating system. Spindle and quill are supported front and rear at all portions of the stroke. The stroke is obtained by a positive return double track cam machined from a solid steel blank. Feed is positively geared and is variable by means of pick-off gears. It drives through a friction clutch that can be adjusted to slip at any desired pressure to protect the tools.

Spindle speeds range from 525 to 8750 revolutions per minute in 63 steps, variable by pick-off gears. This extreme range permits the use of small drills when needed. The unit, shown at the bottom of page, can be furnished with any stroke up to a maximum of 2¾ inches and with any feed or combination of feeds within the range of the tools. Action is automatic and includes a rapid approach to the work, feed or feeds, rapid return and stop. By adjusting a set screw the cycle can be made continuous instead of stopping on the rapid return. The standard motor furnished is a built-in ¾ horsepower 440 or 220 volt, alternating current motor, although other motors can be furnished on special order.

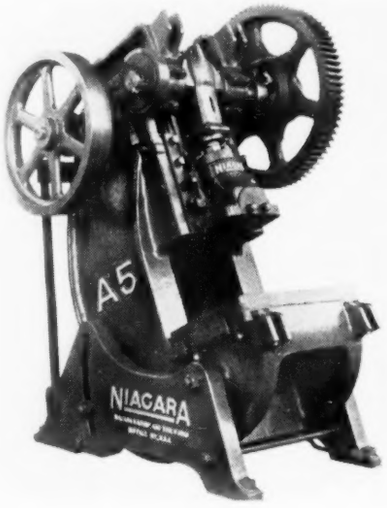
• • •

### Heavy-Duty Press—

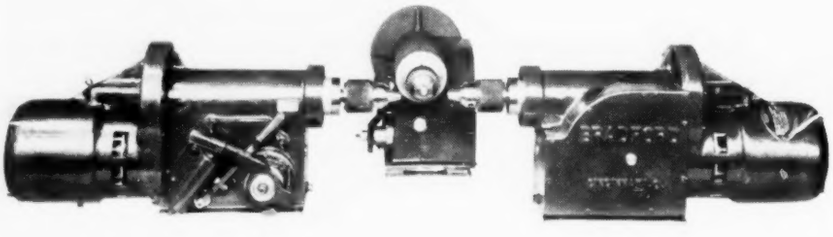
Niagara Machine & Tool Works, 637 Northland avenue, Buffalo, is placing on the market an improved 5-inch diameter shaft press designated No. A-5. Features of this new unit, shown herewith, include a one-piece steel casting frame designed to have not only a high factor of safety, with reference to strength, but to have maximum rigidity vertically, horizontally and torsionally, as well as to provide rigid gib mountings, rigidity about the upper bearings, rigidity of back shaft mounting and stiffness of bed.

The press is equipped with a six point engagement pin clutch, providing more prompt engagement, more strokes per minute and above all contributing to safe operation because the greater number of engagement points eliminate lag, thus enabling the press operator to synchronize his feet and hands. This clutch is also provided with a safety stop to prevent repeating through over-high travel of the shaft and with a device to lock the clutch pin out of engagement when setting dies.

The brake is equipped with a spring that automatically compensates for expansion due to heat of operation, as well as automatically compensating for wear. The brake block and brake band are marked with suitable marks to indicate the correct adjustment of the brake, thus eliminating guess work.




The slide, like the frame, is extremely rigid and strong to maintain accuracy, to provide suitable mounting for dies and to promote longer die life. A new "breech block" type of die clamp is used. This die clamp is cylindrical in shape and is ground to close tolerance. It fits in a smooth bored hole, the center of which is sufficiently above the bottom of the slide to prevent it from sagging. Being contained within the slide, it has no vertical play and gives solid support to the die under pressure.



*Bradford No. 6 automatic unit type drilling head is totally enclosed*

# Demand Levels Off, Checks Rise in Steel Rate

## Operations Fail To Gain for First Time Since Early December—Automotive Shipments Holding Up—Structurals, Railroads Lagging

AFTER nine consecutive weeks of improvement in steelworks operations, steel demand is leveling off, new commitments so far in February falling below tonnage booked last month.

The first effect of this was apparent last week when the national rate held unchanged at 54½ per cent. A sharp reduction was made at Youngstown, and Pittsburgh is scheduled for a decline of 2 points, which may lower the national average this week. A reaction in the upward swing would not be without precedent.

Shipments to the automobile industry, which last week increased its output 5000 units to 78,500, are believed to have reached a peak for the present, but barring labor difficulties are expected to hold close to this level for several months.

The market for iron and steel, however, is approaching a test as to underlying strength. Steelmakers are scanning structural and railroad prospects for another lift, but admittedly see little tonnage from these until March or April.

With 8000 tons of structural shapes placed for a Manhattan, New York, express highway, awards last week totaled 20,305 tons, double the preceding week. Bids will be taken March 1 on 9000 tons for an addition to the Library of Congress building, Washington.

### Two Large Government Projects Considered for Pipe and Wire; Rail Awards Are Light

Nearly 200,000 tons of steel pipe will be required if negotiations between Texas and Secretary Ickes for a natural gas line from the Panhandle to St. Louis and Detroit are successful. The government is reviving the project for a western tree shelter belt, which when discussed last fall was estimated to require 192,500 tons of steel fence posts and 165,000 tons of wire. A revision on a more moderate scale is being considered. Financing difficulties stand in the way of numerous private barge purchases at Pittsburgh.

The Carnegie Steel Co. has completed its February rail schedules at the Edgar Thomson, Braddock, Pa., mills and may not resume until March. St. Louis & San Francisco has awarded 15,000 tons of rails to the Tennessee Coal, Iron & Railroad Co., and the Burlington has distributed 16,000 tons of rails and 8000 tons of accessories to several producers. Freight car awards in January totaled 24, compared with 110 in December.

Current inquiries for steel mill equipment are estimated at $50,000,000. Bethlehem Steel Co. will spend $500,000 for equipment to roll spring steel and heat treat wire at its Johnstown, Pa., plant. An order for 37 by-product coke ovens booked by the Koppers Construction Co. for the Public Service Corp. of New Jersey is the first additional coking capacity since 1930.

A more definite impression prevails that iron and steel prices will not be advanced for second quarter when books are opened March 1. Demand for many of the heavy finished steel products, such as plates, shapes, reinforcing material, pipe and rails has shown little or no improvement on which to base higher prices.

### Reinforcing Bars Cut $2 a Ton; January Ingot Output Largest for Month Since 1930

On 1200 tons of reinforcing bars for a dam in the Muskingum, Ohio, conservancy district, a Youngstown producer submitted a bid $2 a ton under the established base price; this being one of the first instances since the President ruled last fall that code prices could be reduced 15 per cent on government work. Open-hearth ingot iron billets have been reduced $1.90 a ton at Cleveland.

Steel ingot output in January, 2,834,170 gross tons, was the largest for that month since 1930. The tonnage was 85 per cent of that produced in May, peak last year. Daily average output 104,969 tons, was 35 per cent more than in December; 44 per cent more than in January, 1934; and 29 per cent over the daily average for all of last year. STEEL's weekly compilations showed a 48 per cent operating rate for January, while the official figure is 47.67, highest since last June, at 52.68.

Steelworks operations in the Chicago district last week increased 1 point to 67 per cent; eastern Pennsylvania 1 to 31; Cleveland 4 to 82; New England 11 to 63. Pittsburgh held at 44; Detroit 100; Birmingham 32; Buffalo 45. Wheeling was down 5 to 90, Youngstown 6 to 58.

STEEL's iron and steel price composites are unchanged; iron and steel $32.56; finished steel $54; and steelworks scrap $11.65.

# COMPOSITE MARKET AVERAGES

| | Feb. 9 | Feb. 2 | Jan. 26 | One Month Ago Jan., 1934 | Three Months Ago Nov., 1934 | One Year Ago Feb., 1934 | Five Years Ago Feb., 1930 |
|---|---|---|---|---|---|---|---|
| Iron and Steel | $32.56 | $32.56 | $32.60 | $32.58 | $32.15 | $31.30 | $34.92 |
| Finished Steel | 54.00 | 54.00 | 54.00 | 54.00 | 54.00 | 51.10 | 55.03 |
| Steelworks Scrap | 11.65 | 11.65 | 28.08 | 12.03 | 9.82 | 11.72 | 14.42 |

Iron and Steel Composite:—Pig iron, scrap, billets, sheet bars, wire rods, tin plate, wire, sheets, plates, shapes, bars, black pipe, rails, alloy steel, hot strip, and cast iron pipe at representative centers. Finished Steel Composite:—Plates, shapes, bars, hot strip, nails, tin plate, pipe. Steelworks Scrap Composite:—Heavy melting steel and compressed sheets.

# A COMPARISON OF PRICES

Representative Market Figures for Current Week; Average for Last Month, Three Months and One Year Ago

## Finished Material

| | Feb. 9, 1935 | Jan., 1935 | Nov., 1934 | Feb., 1934 |
|---|---|---|---|---|
| Steel bars, Pittsburgh | 1.80c | 1.80c | 1.80c | 1.75c |
| Steel bars, Chicago | 1.85 | 1.85 | 1.85 | 1.80 |
| Steel bars, Philadelphia | 2.09 | 2.09 | 2.09 | 2.04 |
| Iron bars, Terre Haute, Ind. | 1.75 | 1.75 | 1.75 | 1.60 |
| Shapes, Pittsburgh | 1.80 | 1.80 | 1.80 | 1.70 |
| Shapes, Philadelphia | 2.00½ | 2.00½ | 2.00½ | 1.90½ |
| Shapes, Chicago | 1.85 | 1.85 | 1.85 | 1.75 |
| Tank plates, Pittsburgh | 1.80 | 1.80 | 1.80 | 1.70 |
| Tank plates, Philadelphia | 1.98½ | 1.98½ | 1.98½ | 1.88½ |
| Tank plates, Chicago | 1.85 | 1.85 | 1.85 | 1.75 |
| Sheets, No. 10, hot rolled, Pitts. | 1.85 | 1.85 | 1.85 | 1.75 |
| Sheets, No. 24, hot ann., Pitts. | 2.40 | 2.40 | 2.40 | 2.25 |
| Sheets, No. 24, galvan., Pitts. | 3.10 | 3.10 | 3.10 | 2.85 |
| Sheets, No. 10 hot rolled, Gary | 1.95 | 1.95 | 1.95 | 1.85 |
| Sheets, No. 24, hot anneal., Gary | 2.55 | 2.55 | 2.55 | 2.35 |
| Sheets, No. 24, galvan., Gary | 3.20 | 3.20 | 3.20 | 2.95 |
| Plain wire, Pittsburgh | 2.30 | 2.30 | 2.30 | 2.20 |
| Tin plate, per base box, Pitts. | 5.25 | 5.25 | 5.25 | 5.25 |
| Wire nails, Pittsburgh | 2.60 | 2.60 | 2.60 | 2.35 |

## Semifinished Material

| | | | | |
|---|---|---|---|---|
| Sheet bars, open-hearth, Youngs. | $28.00 | $28.00 | $28.00 | $26.00 |
| Sheet bars, open-hearth, Pitts. | 28.00 | 28.00 | 28.00 | 26.00 |
| Billets, open-hearth, Pittsburgh | 27.00 | 27.00 | 27.00 | 26.00 |
| Wire rods, Pittsburgh | 38.00 | 38.00 | 38.00 | 36.00 |

## Pig Iron

| | Feb. 9, 1935 | Jan., 1935 | Nov., 1934 | Feb., 1934 |
|---|---|---|---|---|
| Bessemer, del. Pittsburgh | $19.76 | $19.76 | $19.76 | $19.26 |
| Basic, Valley | 18.00 | 18.00 | 18.00 | 17.00 |
| Basic, eastern, del. eastern Pa. | 19.76 | 19.76 | 19.76 | 18.76 |
| No. 2 foundry, del. Pittsburgh | 19.26 | 19.26 | 19.26 | 18.76 |
| No. 2, foundry, Chicago | 18.50 | 18.50 | 18.50 | 17.50 |
| Southern No. 2, Birmingham | 14.50 | 14.50 | 14.50 | 13.50 |
| No. 2X eastern, del. Philadelphia | 20.63 | 20.63 | 20.63 | 19.63 |
| Malleable, Valley | 18.50 | 18.50 | 18.50 | 17.50 |
| Malleable, Chicago | 18.50 | 18.50 | 18.50 | 17.50 |
| Lake Superior charcoal, del. Chi. | 24.04 | 24.04 | 24.04 | 23.54 |
| Ferromanganese, del. Pittsburgh | 89.79 | 18.63 | 18.63 | 18.38 |
| Gray forge, del. Pittsburgh | 18.63 | 89.79 | 89.79 | 90.24 |

## Scrap

| | | | | |
|---|---|---|---|---|
| Heavy melting steel, Pittsburgh | $13.25 | $13.50 | $11.15 | $13.90 |
| Heavy melt. steel, No. 2, east. Pa. | 10.25 | 9.95 | 8.35 | 9.75 |
| Heavy melting steel, Chicago | 11.75 | 12.15 | 9.10 | 10.90 |
| Rails for rolling, Chicago | 12.75 | 12.90 | 10.35 | 11.90 |
| Railroad steel specialties, Chicago | 12.75 | 13.40 | 10.05 | 12.50 |

## Coke

| | | | | |
|---|---|---|---|---|
| Connellsville, furnace, ovens | $3.60 | $3.60 | $3.60 | $3.50 |
| Connellsville, foundry, ovens | 4.60 | 4.60 | 4.60 | 4.25 |
| Chicago, by-product foundry, del. | 9.25 | 9.25 | 9.25 | 9.25 |

# Steel, Iron, Raw Material, Fuel and Metals Prices

*Prices are code levels filed with American Iron and Steel Institute, 350 Fifth avenue, New York. Except when otherwise designated, prices are base, f.o.b. cars. Asterisk denotes price change this week.*

## Sheet Steel

**Hot Rolled No. 10, 24-48 in.**

| | |
|---|---|
| Pittsburgh | 1.85c |
| Gary | 1.95c |
| Chicago, delivered | 1.98c |
| New York, del. | 2.18c |
| Philadelphia, del | 2.14c |
| Birmingham | 2.00c |
| St. Louis, del. | 2.17c |
| Pacific ports, f.o.b. cars, dock | 2.40c |

**Hot Rolled Annealed No. 24**

| | |
|---|---|
| Pittsburgh | 2.40c |
| Gary | 2.50c |
| Chicago, delivered | 2.53c |
| Detroit, delivered | 2.60c |
| New York, del. | 2.73c |
| Philadelphia, del. | 2.69c |
| Birmingham | 2.55c |
| St. Louis, del. | 2.72c |
| Pacific ports, f.o.b. cars, dock | 3.05c |

**Galvanized No. 24**

| | |
|---|---|
| Pittsburgh | 3.10c |
| Gary | 3.20c |
| Chicago, delivered | 3.23c |
| Philadelphia, del. | 3.39c |
| New York, del. | 3.43c |
| Birmingham | 3.25c |
| St. Louis, del. | 3.42c |
| Pacific ports, f.o.b. cars, dock | 3.70c |

**Tin Mill Black No. 28**

| | |
|---|---|
| Pittsburgh | 2.75c |
| Gary | 2.85c |
| St. Louis, delivered | 3.07c |

**Cold Rolled No. 10**

| | |
|---|---|
| Pittsburgh | 2.50c |
| Gary | 2.60c |
| Detroit, delivered | 2.70c |
| Philadelphia, del. | 2.79c |
| New York, del. | 2.83c |
| Pacific ports, f.o.b. cars, dock | 3.10c |

**Cold Rolled No. 20**

| | |
|---|---|
| Pittsburgh | 2.95c |
| Gary | 3.05c |
| Detroit, delivered | 3.15c |
| Philadelphia, del. | 3.24c |
| New York, del. | 3.28c |

**Enameling Sheets**

| | |
|---|---|
| Pittsburgh, No. 10 | 2.50c |
| Pittsburgh, No. 20 | 3.10c |

## Tin and Terne Plate

Gary base, 10 cents higher.

| | |
|---|---|
| Tin plate, coke base con. (box) Pitts. | $5.25 |
| Do., waste-waste | 2.75c |
| Do., strips | 2.50c |
| Long ternes, No. 24 unassorted, Pitts. | 3.40c |
| Do., Gary | 3.50c |

## Corrosion and Heat-Resistant Alloys

Pittsburgh base, cents per lb.

**Chrome-Nickel**

| | No. 302 | No. 304 |
|---|---|---|
| Bars | 23.00 | 24.00 |
| Plates | 26.00 | 28.00 |
| Sheets | 33.00 | 35.00 |
| Hot strip | 20.75 | 22.75 |
| Cold strip | 27.00 | 29.00 |

**Straight Chromes**

| | No. 410 | No. 430 | No. 442 | No. 446 |
|---|---|---|---|---|
| Bars | 17.00 | 18.50 | 21.00 | 26.00 |
| Plates | 20.00 | 21.50 | 24.00 | 29.00 |
| Sheets | 25.00 | 28.00 | 31.00 | 35.00 |
| Hot strip | 15.75 | 16.75 | 21.75 | 26.75 |
| Cold stp. | 20.50 | 22.00 | 27.00 | 35.00 |

## Steel Plates

| | |
|---|---|
| Pittsburgh | 1.80c |
| New York, del. | 2.08c |
| Philadelphia, del. | 1.98½c |
| Boston, delivered | 2.20c |
| Buffalo, delivered | 2.03½c |
| Chicago or Gary | 1.85c |
| Cleveland, del. | 1.98½c |
| Birmingham | 1.95c |
| Coatesville, base | 1.90c |
| Sparrows Pt., base | 1.90c |
| Pacific ports, f.o.b. cars, dock | 2.35c |
| St. Louis, delivered | 2.07c |

## Structural Shapes

| | |
|---|---|
| Pittsburgh | 1.80c |
| Philadelphia, del. | 2.00½c |
| New York, del. | 2.05½c |
| Boston, delivered | 2.18½c |
| Bethlehem | 1.90c |
| Chicago | 1.85c |
| Cleveland, del. | 1.98½c |
| Buffalo | 1.90c |
| Gulf Ports | 2.20c |
| Birmingham | 1.95c |
| Pacific ports, f.o.b. cars, dock | 2.35c |

## Bars

**Soft Steel**

| | |
|---|---|
| Pittsburgh | 1.80c |
| Chicago or Gary | 1.85c |
| Duluth | 1.95c |
| Birmingham | 1.95c |
| Cleveland | 1.85c |
| Buffalo | 1.90c |
| Detroit, delivered | 1.95c |
| Pacific Coast ports cars, dock, c.i.f. | 2.35c |
| Philadelphia, del. | 2.09c |
| Boston, delivered | 2.20c |
| New York, del. | 2.13c |
| Pitts., forg. qual. | 1.95c-2.05c |

**Rail Steel**

To Manufacturing Trade

| | |
|---|---|
| Pittsburgh | 1.70c |
| Chicago or Gary | 1.75c |
| Moline, Ill. | 1.75c |
| Cleveland | 1.75c |
| Buffalo | 1.80c |

IRON

| | |
|---|---|
| Terre Haute, Ind. | 1.75c |
| Chicago | 1.80c |
| Philadelphia | 1.89c |
| Pittsburgh, refined | 2.75-7.50c |

REINFORCING

New billet, straight lengths, quoted by distributors.

| | |
|---|---|
| Pittsburgh | 2.05c |
| Chicago, Gary, Buffalo Cleve., Birm., Young | 2.10c |
| Gulf ports | 2.45c |
| Pacific coast ports f.o.b. cars dock | 2.45c |
| Philadelphia, del. | 2.34c |

Rail Steel

Straight lengths quoted by distributors

| | |
|---|---|
| Pittsburgh | 1.90c |
| Chicago, Buffalo, Cleveland, Birm., Young | 1.95c |
| Gulf ports | 2.30c |

## Wire Products

(Prices apply to straight or mixed carloads; pool cars, or less, 15c up. 10% dis. on nail extras on straight or mixed carloads to one consignee.)

Base, Pitts.-Cleve. 100 lb. keg

| | |
|---|---|
| Standard wire nails | $2.60 |
| Cement coated nails | 2.60 |
| Galvanized nails, 15 gage and coarser | 4.60c |
| do., 16 gage and finer | 5.10c |

(Per pound)

| | |
|---|---|
| Polished staples | 3.30c |
| Galvanized fence staples | 3.55c |
| Barbed wire, galv. | 3.00c |
| Annealed fence wire | 2.45c |
| Galvanized fence wire | 2.80c |
| Woven wire fencing (base column, c.l.) | $63.00 |
| Plain wire, 6-9 gage to mfg. trade | 2.30c |

Anderson, Ind., (merchant products only) and Chicago up $1; Duluth up $2; Birmingham up $3.

| | |
|---|---|
| Spring wire, Pittsburgh or Cleveland | 2.90c |

Do., Chicago up $1, Worcester, $2.

## Cold-Finished Carbon Bars and Shafting

Base Pitts., one size, shape, grade, shipment at one time to one destination

| | |
|---|---|
| 10,000 to 19,999 lbs. | 2.10c |
| 20,000 to 59,999 lbs. | 2.05c |
| 60,000 to 99,999 lbs. | 2.00c |
| 100,000 lbs and over | 1.97½c |

Gary, Ind., Cleveland, up 5c; Buffalo, up 10c; Detroit, up 20c; eastern Michigan, up 25c.

## Alloy Steel Bars (Hot)

| | |
|---|---|
| Pittsburgh, Buffalo, Chicago, Massillon, Canton, Bethlehem | 2.45c |

| S.A.E. | Alloy Diff. | S.A.E. | Alloy Diff. |
|---|---|---|---|
| 2000 | 0.25 | 3100 | 0.55 |
| 2100 | 0.55 | 3200 | 1.35 |
| 2300 | 1.50 | 3300 | 3.80 |
| 2500 | 2.25 | 3400 | 3.20 |
| 4100 | 0.15 to 0.25 Mo. | | 0.50 |
| 4600 | 0.20 to 0.30 Mo. 1.25 1.75 Ni. | | 1.05 |
| 5100 | 0.80-1.10 Cr | | 0.45 |
| 5100 | Cr. spring | | base |
| 6100 | bars | | 1.20 |
| 6100 | spring | | 0.70 |
| Cr., Ni., Van. | | | 1.50 |
| Carbon Van. | | | 0.95 |
| 9250 | Carbon base plus extras | | |

## Piling

| | |
|---|---|
| Pittsburgh | 2.15c |
| Chicago, Buffalo | 2.25c |

## Strip and Hoops

Hot strip to 23½-in.

| | |
|---|---|
| Pittsburgh | 1.85c |
| Chicago, base | 1.95c |
| Birmingham base, | 2.00c |
| Detroit, delivered | 2.05c |
| Phila., delivered | 2.14c |
| New York, del. | 2.18c |
| Cooperage hoop, Pittsburgh | 1.95c |
| Chicago | 2.05c |
| Cold-rolled strip, Pitts., Cleve. | 2.60c |
| Worcester, Mass. | 2.80c |

## Rails, Track Material

(Gross Tons)

| | |
|---|---|
| Standard rails, mill | $36.37½ |
| Relay rails, Pitts. 24-45 lbs. | $26.00 |
| 50-60 lbs. | $23.00 |
| 70-75 lbs. | $20.00 |
| 80-85 lbs. | $24.00 |
| 100 lbs. | $25.00 |
| Light Rails billet qual. Pitts., Chi. | $35.00 |
| Do., reroll. qual. | $34.00 |
| Angle bars, mills | 2.55c |
| Spikes, R. R. base | 2.40c |
| Track bolts, base | 3.55c |
| Tie plates, base | 1.90c |

Base, light rails 25 to 40 lbs.; 50 to 60 lbs. inclusive up $5; 16 and 20 lbs., up $1; 12 lbs. up $8; 8 and 10 lbs., up $5. Base railroad spikes 200 kegs or more; base tie plates 20 tons.

## Bolts and Nuts

Pittsburgh, Cleveland, Birmingham, Chicago. Discounts to legitimate trade for all case lots. Dec. 1, 1932, lists.

CARRIAGE BOLTS

| | |
|---|---|
| All sizes, cut thread | 70-10-10 off |
| Rolled thread, ½ x 6 and smaller | 70-10-10 off |

MACHINE BOLTS

| | |
|---|---|
| All sizes, cut thread lag screws, plow bolts, Nos. 1-2-3-7 heads, tap bolts, blank bolts, stud bolts, | 70-10-10 off |
| Tire bolts | 60-10 off |
| Stove bolts, 75 off in pkgs.; 83 off on 15,000 of 3-inch and shorter, or 5000 over 3-inch | |
| Rolled thread machine bolts, ½ x 6 and smaller | 70-10-10 off |
| Step bolts | 70-10 off |
| Elevator bolts | 70-10 off |

NUTS

| | |
|---|---|
| S.A.E. semifinished hex.; ½ to ⅞-inch | 70-10-10 off |
| Do., ½ to 1-inch | 70-10-10 off |
| Do., over 1-inch | 70-10 off |

HEXAGON CAP SCREWS

| | |
|---|---|
| Milled | 85 off |
| Upset, 1-in., smaller | 85 off |

SQUARE HEAD SET SCREWS

| | |
|---|---|
| Upset, 1-in. small | 70-10 off |
| Headless set screws | 75 off |

## Rivets, Wrought Washers

| | |
|---|---|
| Struc., c. l., Pittsburgh, Cleveland | 2.90c |
| Struc., c. l., Chicago | 3.00c |
| ⅞-in. and smaller, Pitts., Chi., Cleve. | 70 and 5 off |
| Wrought washers, Pitts., Chi., Phila. | 6.25 off |

## Cut Nails

| | |
|---|---|
| Cut nails, Pitts.; (10% discount on size extras) | $2.75 |
| Do. less carloads, 5 kegs or more no discount on size extras | $3.05 |
| Do. under 5 kegs; no discount on size extras | $3.20 |

## Pipe and Tubing

Base $200 net ton, except on standard commercial seamless boiler tubes under 2 inches and cold drawn seamless tubing.

## Welded Iron, Steel Pipe

Base discounts on steel pipe, Pitts., Lorain, O., to consumers in carloads, Gary, Ind., 2 points less. Chicago delivered 2½ points less. Wrought pipe, Pittsburgh base.

BUTT WELD

| In. | Blk. | Gal. |
|---|---|---|
| Steel | | |
| ¼ and ⅜ | 53½ | 35 |
| ½ | 58½ | 47 |
| ¾ | 62 | 52 |
| 1—3 | 64 | 55 |
| Iron | | |
| ½ | 31½ | 15 |
| ¾ | 36½ | 20½ |
| 1—1¼ | 39½ | 25½ |
| 2 | 41½ | 26 |

LAP WELD

| | | |
|---|---|---|
| Steel | | |
| 2 | 60 | 51 |
| 2½—3 | 63 | 54 |
| 3½—6 | 65 | 56 |
| 7 and 8 | 64 | 54 |
| 9 and 10 | 63½ | 53½ |
| Iron | | |
| 2 | 37 | 22½ |
| 2½—3½ | 38 | 25 |
| 4—8 | 40 | 28½ |

LINE PIPE

| | |
|---|---|
| Steel | |
| ½, butt weld | 57½ |
| ⅛-inch, butt weld | 50½ |
| ¼—⅜, butt weld | 52½ |
| ¾, butt weld | 61 |
| 1—3, butt weld | 63 |
| 2-inch, lap weld | 59 |
| 2½—3, lap weld | 62 |
| 3½—6, lap weld | 64 |
| 7—8, lap weld | 63 |
| Iron | |
| ⅛—1½ inch, black and galv. take 4 pts, over; 2½—6 inch 2 pts. over discounts for same sizes, standard pipe lists, 8—12-inch, no extra. | |

BOILER TUBES

*C. L. Discounts, f.o.b. Pitts.*

| *Lap Weld Steel* | | *Charcoal Iron* | |
|---|---|---|---|
| 2—2¼ | 33 | 1¾ | 8 |
| 2½—2¾ | 40 | 2—2¼ | 13 |
| 3 | 47 | 2½—2¾ | 16 |
| 3¼—3½ | 50 | 3 | 17 |
| 4 | 52 | 3¼—3½ | 18 |
| 4½—5 | 42 | 4 | 20 |
| | | 4½ | 21 |

In lots of a carload or more, above discounts subject to preferential of two 5% and one 7½% discount on steel and 10% on charcoal iron.

Lapwelded steel: 200 to 9999 pounds, ten points under base, one 5% and one 7½%. Under 2000 pounds 15 points under base, one 5% and one 7½%. Charcoal iron: 10,000 pounds to carloads, base less 5%; under 10,000 lbs., 2 points under base.

SEAMLESS BOILER TUBES

Under date of May 15 in lots of 40,000 pounds or more for cold-drawn boiler tubes and in lots of 40,000 pounds or feet or more for hot-finished boiler tubes, revised prices are quoted for 55 cold-drawn boiler tube sizes ranging from ¼ to 6-inch outside diameter in 30 wall thicknesses, decimal equivalent from 0.035 to 1.000, on a dollars and cents basis per 100 feet and per pound.

Hot-finished carbon steel boiler tube prices also under date of May 15 range from 1 through 7 inches outside diameter, inclusive, and embrace 47 size classifications in 22 decimal wall thicknesses ranging from 0.109 to 1.000, prices also being on a lb. and 100 ft. basis.

## Seamless Tubing

*Cold drawn; f.o.b. mill disc.*

| | |
|---|---|
| 100 ft. or 150 lbs. | 32% |
| 15,000 ft. or 22,500 lbs. | 70% |

## Cast Iron Water Pipe

*Class B Pipe—Per Net Ton*

| | |
|---|---|
| 6-in. & over, Birm. | $38.00-39.00 |
| 4-in., Birmingham | 41.00-42.00 |
| 4-in., Chicago | 49.00-50.00 |
| 6 to 24-in., Chicago | 46.00-47.00 |
| 6-in. & over, east fdy. | 42.00 |
| Do., 4-in. | 45.00 |

Class A pipe $3 over Class B. Stnd. fitgs., Birm. base—$100.00

## Semifinished Steel

BILLETS AND BLOOMS

*4 x 4-inch base; gross ton*

| | |
|---|---|
| Pitts., Chi., Cleve., and Youngstown | $27.00 |
| Philadelphia | 32.30 |
| Duluth | 31.00 |
| Forging, Pitts., Chi. and Buffalo | 32.00 |
| Forging, Duluth | 36.00 |

SHEET BARS

| | |
|---|---|
| Pitts., Cleve., Young., Chi., Buff., Canton, Sparrows Pt. | 28.00 |

SLABS

| | |
|---|---|
| Pitts., Cleve., Young. | 27.00 |

WIRE RODS

*(Common; combination up $2)*

| | |
|---|---|
| Pitts., Cleveland | 38.00 |
| Chicago | 39.00 |
| Worcester, Mass. | 40.00 |

SKELP

| | |
|---|---|
| Pitts., Chi., Young., Buff., Coatesville, Sparrows Point | 1.70c |

## Coke

*Price Per Net Ton*

BEEHIVE OVENS

| | |
|---|---|
| Connellsville, fur. | $3.60- 3.85 |
| Connellsville, fdry. | 4.60 |
| Connel. prem. fdry. | 5.10 |
| New River fdry. | 6.00 |
| Wise county fdry | 4.45- 5.25 |
| Wise county fur. | 4.00- 4.50 |

BY-PRODUCT FOUNDRY

| | |
|---|---|
| Newark, N. J., del. | 9.20- 9.65 |
| Chi., ov., outside del. | 8.50 |
| Chicago, del. | 9.25 |
| New England, del. | 11.00 |
| St. Louis, del. | 9.25 |
| Birmingham, ovens | 6.00 |
| Indianapolis, del. | 8.75 |
| Cincinnati, del. | 9.30 |
| Cleveland, del. | 9.25 |
| Buffalo, ovens | 7.50- 8.00 |
| Detroit ov., out. del. | 8.50 |
| Philadelphia, del. | 9.00 |

## Coke By-Products

Per gallon, producers' plants.

| | Tank lots | Spot |
|---|---|---|
| Pure and 90% benzol | 15.00c | |
| Toluol | 30.00c | |
| Solvent naphtha | 26.00c | |
| Commercial xylol | 26.00c | |

Per lb. f.o.b. New York.

| | |
|---|---|
| Phenol (200 lb. drums) | 16.30c |
| Do. (100 lbs.) | 17.30c |

Eastern Plants, per lb.

| | |
|---|---|
| Naphthalene flakes and balls, in bbls. | 5.00c |

Per 100 lb. Atlantic seaboard

| | |
|---|---|
| Sulphate of ammonia | $1.20 |

†Western prices, ½-cent up.

## Pig Iron

Delivered prices do not include switching charges except as noted. No. 2 foundry iron is 1.75-2.25 silicon; 25-cent differentials apply for each 0.25 silicon above 2.25; 50-cent differentials apply to any grade below 1.75. Gross tons.

| BASING POINTS: | No. 2 Fdry. | Malleable | Basic | Bessemer |
|---|---|---|---|---|
| Bethlehem, Pa. | $19.50 | $20.00 | $19.00 | $20.50 |
| Birdsboro, Pa. | 19.50 | 20.00 | 19.00 | 20.50 |
| Birmingham, Ala., southern del. | 14.50 | 14.50 | 13.50 | 19.00 |
| Buffalo | 18.50 | 19.00 | 17.50 | 19.50 |
| Chicago | 18.50 | 18.50 | 18.00 | 19.00 |
| Cleveland | 18.50 | 18.50 | 18.00 | 19.00 |
| Detroit | 18.50 | 18.50 | 18.00 | 19.00 |
| Duluth | 19.00 | 19.00 | ..... | 19.50 |
| Erie, Pa. | 18.50 | 19.00 | 18.00 | 19.50 |
| Everett, Mass. | 19.50 | 20.00 | 19.00 | 20.50 |
| Granite City, Ill. | 18.50 | 18.50 | 18.00 | ..... |
| Hamilton, O. | 18.50 | 18.50 | 18.00 | 19.00 |
| Jackson, O. | 20.25 | 20.25 | 19.75 | ..... |
| Neville Island, Pa. | 18.50 | 18.50 | 18.00 | 19.00 |
| Provo, Utah | 17.50 | ..... | 17.00 | ..... |
| Sharpsville, Pa. | 18.50 | 18.50 | 18.00 | 19.00 |
| Sparrows Point, Md. | 19.50 | ..... | 19.00 | ..... |
| Swedeland, Pa. | 19.50 | 20.00 | 19.00 | 20.50 |
| Toledo, O. | 18.50 | 18.50 | 18.00 | 19.00 |
| Youngstown, O. | 18.50 | 18.50 | 18.00 | 19.00 |
| DELIVERED FROM BASING POINTS: | | | | |
| Akron, O., from Cleveland | 19.76 | 19.76 | 19.26 | 20.26 |
| Baltimore from Birmingham | 20.02 | ..... | 19.90 | ..... |
| Boston from Birmingham | 19.62 | ..... | 19.50 | ..... |
| Boston from Everett, Mass. | 20.00 | 20.50 | 19.50 | 21.00 |
| Boston from Buffalo | 20.00 | 20.50 | 19.50 | 21.00 |
| Brooklyn, N. Y., from Bethlehem | 21.77 | 22.27 | ..... | ..... |
| Brooklyn, N. Y., from Bmgham. | 21.39 | ..... | ..... | ..... |
| Canton, O., from Cleveland | 19.76 | 19.76 | 19.26 | 20.26 |
| Chicago from Birmingham | †18.72 | ..... | 18.60 | ..... |
| Cincinnati from Hamilton, O. | 19.51 | 19.51 | 19.01 | ..... |
| Cincinnati from Birmingham, | 19.13 | ..... | 19.01 | ..... |
| Cleveland from Birmingham | 18.62 | ..... | 18.50 | ..... |
| Indianapolis from Hamilton, O. | 20.77 | 20.77 | 20.27 | 21.27 |
| Mansfield, O., from Toledo, O. | 20.26 | 20.26 | 19.76 | 20.76 |
| Milwaukee from Chicago | 19.50 | 19.50 | 19.00 | 20.00 |
| Muskegon, Mich., from Chicago, Toledo or Detroit | 21.40 | 21.40 | 20.90 | 21.90 |
| Newark, N. J., from Birmingham | 20.51 | ..... | ..... | ..... |
| Newark, N. J., from Bethlehem. | 20.89 | 21.39 | ..... | ..... |
| Philadelphia from Birmingham. | 19.88 | ..... | 19.76 | ..... |
| Philadelphia from Swedeland, Pa. | 20.26 | 20.76 | 19.76 | ..... |
| Pittsburgh district from Neville Island | (Neville Island base, plus 63c, 76c and $1.13 switching chgs.) | | | |
| Saginaw, Mich., from Detroit | 20.60 | 20.60 | 20.10 | 21.10 |
| St. Louis from Granite City, Ill. | 19.00 | 19.00 | 18.50 | ..... |
| St. Louis from Birmingham | 18.62 | ..... | 18.50 | ..... |
| St. Paul from Duluth | 20.94 | 20.94 | ..... | 21.44 |

†Over 0.70 phos.

LOW PHOS.

Basing Point: Philadelphia, standard and copper bearing 24.63
N. Y.—$23.50.
Basing Point: Philadelphia, standard and copper bearing 24.63

| GRAY FORGE | | CHARCOAL | |
|---|---|---|---|
| Valley furnace | 18.00 | Lake Superior fur. | 21.00 |
| Pitts. dist. fur. | 18.00 | Do., del. Chicago | 24.04 |

SILVERY†

Jackson County, O., base; 6%—$22.75; 7—$23.75; 8—$24.75; 9—$25.70; 10—$26.75; 11—$27.75. Buffalo base prices, $1.25 higher.

BESSEMER FERROSILICON†

Jackson County, O., base, 10%—$27.75; 11—$28.75; 12—$30.25; 13—$31.75; 14—$33.25; 15—$34.75; 16—$36.25. Buffalo base prices $1.25 higher.

†The lower all-rail delivered price from Jackson, O., or Buffalo is quoted with freight allowed.

## Iron Ore

LAKE SUPERIOR ORE
*Gross ton, 51½% Lower Lake Ports*

| | |
|---|---|
| Old range bessemer | $4.80 |
| Mesabi nonbess. | 4.50 |
| High phosphorus | 4.40 |
| Mesabi bessemer | 4.65 |
| Old range nonbes. | 4.65 |

EASTERN LOCAL ORES
*Cents, unit, del. E. Pa.*

| | |
|---|---|
| Foundry and basic 56-63% con. (nom.) | 8.00- 9.00 |
| Cop.-free low phos. 58-60% (nom.) | 10.00-10.50 |

FOREIGN ORE
*Cents per unit, f.a.s. Atlantic ports (nominal)*

| | |
|---|---|
| Foreign manganiferous ore, 45.55% iron, 6-10% man., | 10.00 |
| No. Afr. & low phos. | 9.50 |
| Swedish basic, 65% | 9.00 |
| Swedish low phos... | 9.50 |
| Spanish No. Africa basic, 50 to 60%.... | 9.00 |
| Tungsten, spot, sh. ton unit, duty pd. | $17.75-18.25 |
| N. F. fdy., 55%..... | 7.00 |
| Chrome ore, 48% gross ton, c.i.f. | $18.00-18.50 |

## Manganese Ore

*(Nominal)*

Prices not including duty, cents per unit cargo lots.

| | |
|---|---|
| Caucasian, 52-55%.. | 26.00 |
| So. African, 52%..... | 26.00 |
| So. Afr., 49-51%..... | 24.00 |
| Indian, 58-50% ..... | nominal |
| Indian, 48-50% ..... | nominal |

## Refractories

*Per 1000 f.o.b. Works*

FIRE CLAY BRICK
*First Quality.*

| | |
|---|---|
| Pa., Ill., Ky., Md., Ga., Mo. | $45.00 |
| Alabama | 45.00 |
| *Second Quality* | |
| Pa., Ill., Ky., Md., Mo., Ga., Ala. | 40.00 |
| *Ohio* | |
| First quality | $40.00-45.00 |
| Intermediary | 37.00 |
| Second quality | 28.00 |

MALLEABLE BUNG BRICK

| | |
|---|---|
| All bases | 50.00 |

SILICA BRICK

| | |
|---|---|
| Pennsylvania | $45.00 |
| Joliet, E. Chicago | 54.00 |
| Birmingham, Ala. | 52.00 |

MAGNESITE

| | |
|---|---|
| Imported dead-burned grains, net ton f.o.b. Chester, Pa., and Baltimore bases (bags) | $45.00 |
| Domestic dead-burned grains, net ton f.o.b. Chester, Pa., and Baltimore bases (bags) | 40.00 |
| Domestic dead-burned gr. net ton f.o.b. Chewelah, Wash. (bulk) | 22.00 |

BASIC BRICK
*Net ton, f.o.b. Baltimore, Plymouth Meeting, Chester, Pa.*

| | |
|---|---|
| Magnesite brick | $65.00 |
| Chrome brick | 45.00 |
| Chemically bonded magnesite | 55.00 |

## Fluorspar, 85-5

| | |
|---|---|
| Washed gravel, duty paid, tide, net ton | $19.50 |
| Washed gravel f.o.b. Ill., Ky., net ton, carloads | $15.50-16.00 |

## Ferroalloys

*Dollars, except Ferrochrome*

| | |
|---|---|
| Ferromanganese, 78-82% tidewater, duty paid | 85.00 |
| Do., Balti. base | 85.00 |
| Do., del. Pittsburgh | 89.79 |
| Spiegeleisen, 19-20% dom. Palmerton, Pa., spot† | 26.00 |
| Do., New Orleans | 26.00 |
| Ferrosilicon, 50% freight all., cl. | 77.50 |
| Do., less carload | 85.00 |
| Do., 75 per cent | 126-130.00 |
| Spot, $5 a ton higher. | |
| Silicomang., 2½ carb. | 90.00 |
| 2% carbon, 95.00; 1%, | 105.00 |
| Ferrochrome, 66-70 chromium, 4-6 carbon, cts. lb. con. del. | 10.00 |
| Ferrotungsten, stand., lb. cont. del. | 1.35- 1.45 |
| Ferrovanadium, 35 to 40% lb., cont., on analysis | 2.70- 2.90 |
| Ferrotitanium, c. l., prod. plant, frt. allow., net ton | 137.50 |
| Spot, 1 ton, frt. allow., lb. | 7.00 |
| do., under 1 ton | 7.50 |
| Ferrophosphorus, per ton, c. l., 17-19% Rockdale, Tenn., basis, 18%, $2 unitage | 50.00 |
| Ferrophosphorus, electrolytic, per ton c. l., 23-26% f.o.b. Anniston, Ala., 24% $2.75 unitage | 65.00 |
| Ferromolybdenum, stand. 55-65%, lb. | 0.95 |
| Molybdate, lb. cont. | 0.89 |

†Carloads, Quan. diff. apply.

## Nonferrous Mill Products

*F.o.b. mill base, cents per lb. except as specified. Copper, brass products based on 9.00c Conn. copper.*

| | |
|---|---|
| **Sheets** | |
| Yellow brass (high) | 14.25 |
| Copper, hot rolled | 16.00 |
| Lead, cut, to jobbers | 7.25 |
| Zinc, 100-lb. base | 9.50 |
| **Tubes and Pipes** | |
| High yellow brass | 16.00 |
| Seamless copper | 16.25 |
| **Rods** | |
| High yellow brass | 12.75 |
| Copper, hot rolled | 13.25 |
| **Anodes** | |
| Copper, untrimmed | 13.75 |
| **Wire** | |
| Yellow brass (high) | 14.75 |

## Old Metals

*Deal. buying prices, cents lb.*

| | |
|---|---|
| **No. 1 Composition Red Brass** | |
| New York | 4.25- 4.50 |
| Chicago | 4.37½-4.62½ |
| Cleveland | 5.12½- 5.35 |
| St. Louis | 4.75- 5.00 |
| **Heavy Copper and Wire** | |
| *New York | 5.75- 6.00 |
| Chicago, No. 1 | 5.50- 5.75 |
| Cleveland | 5.50- 5.75 |
| St. Louis | 5.50- 5.65 |
| **Composition Brass Borings** | |
| New York | 3.75- 4.00 |
| **Light Copper** | |
| *New York | 4.50- 4.75 |
| Chicago | 4.25- 4.50 |
| Cleveland | 4.75- 5.00 |
| St. Louis | 4.75- 5.00 |
| **Light Brass** | |
| Chicago | 2.25- 2.50 |
| Cleveland | 2.50- 2.75 |
| **Lead** | |
| *New York | 2.62½- 2.75 |
| *Cleveland | 2.35- 2.60 |
| *Chicago | 2.50- 2.75 |
| St. Louis | 2.75- 2.90 |
| **Zinc** | |
| New York | 1.75- 2.00 |
| Cleveland | 1.75- 2.00 |
| St. Louis | 2.25- 2.40 |
| **Aluminum** | |
| Borings, Cleveland | 7.50- 8.00 |
| Mixed, cast, Clev. | 12.50-13.00 |
| Mixed, cast, St. L. | 13.00-13.50 |
| Clips, soft, Clev. | 13.50-14.00 |

## Secondary Metals

| | |
|---|---|
| Brass ingot, 85-5-5-5 | 8.25 |
| Stand. No. 12 Alum. | 16.00-17.00 |

# Iron and Steel Scrap Prices

*Corrected to Friday night  Gross tons delivered to consumers, except where otherwise stated*

**HEAVY MELTING STEEL**

| | |
|---|---|
| Birmingham | 9.00- 9.50 |
| Boston, dock, expt. | 9.00- 9.25 |
| Boston, domestic | 7.25- 7.50 |
| Buffalo, No. 1 | 12.00-12.50 |
| Buffalo, No. 2 | 10.50-11.00 |
| Chicago, No. 1 | 11.50-11.75 |
| Cleveland, No. 1 | 11.00-11.50 |
| Cleveland, No. 2 | 10.50-11.00 |
| Detroit, No. 1 | 9.50-10.00 |
| Detroit, No. 2 | 8.50- 9.00 |
| Eastern Pa., No. 1 | 11.50-12.00 |
| Eastern Pa., No. 2 | 10.00-10.50 |
| Federal, Ill. | 8.25- 8.75 |
| Granite City, R. R. | 9.50-10.00 |
| Granite City, No. 2 | 7.50- 8.00 |
| N. Y., deal. No. 2 | 7.50- 7.75 |
| N. Y., deal. barge | 9.00- 9.25 |
| Pittsburgh, No. 1 | 13.00-13.50 |
| St. Louis | 8.00- 8.50 |
| Valleys, No. 1 | 13.25-13.75 |

**COMPRESSED SHEETS** ☐

| | |
|---|---|
| Buffalo, dealers | 10.50-11.00 |
| Chicago, factory | 10.50-11.00 |
| Chicago, dealer | 9.50-10.00 |
| Cleveland | 11.00-11.50 |
| Detroit | 10.00-10.50 |
| E. Pa., new mat. | 10.00-10.50 |
| Pittsburgh | 13.00-13.50 |
| St. Louis | 7.00- 7.50 |
| Valleys | 12.75-13.00 |

**BUNDLED SHEETS** ☐ ☐

| | |
|---|---|
| Buffalo | 8.00- 8.50 |
| Cincinnati, del. | 7.00- 7.50 |
| Cleveland | 8.50- 9.00 |
| Pittsburgh | 11.50-12.00 |
| St. Louis | 5.00- 5.50 |

**SHEET CLIPPINGS, LOOSE** ☐

| | |
|---|---|
| Chicago | 6.00- 6.50 |
| Cincinnati | 6.50- 7.00 |
| Detroit | 5.00- 5.50 |
| St. Louis | 5.00- 5.50 |

**STEEL RAILS, SHORT** ☐

| | |
|---|---|
| Birmingham | 12.00-12.50 |
| Buffalo | 13.00-13.50 |
| Chicago (3 ft.) | 13.00-13.50 |
| Chicago (2 ft.) | 14.00-14.50 |
| Cincinnati, del. | 12.50-13.00 |
| Detroit | 12.00-12.50 |
| Pitts., open-hearth, 3 ft. and less | 14.50-15.00 |
| St. Louis, 2 ft. & less | 12.50-13.00 |

**STEEL RAILS, SCRAP** ☐

| | |
|---|---|
| Boston | 7.00- 7.25 |
| Chicago | 11.50-11.75 |
| Pittsburgh | 13.50-14.00 |

**STOVE PLATE** ☐ ☐

| | |
|---|---|
| Birmingham | 6.00- 6.50 |
| Boston, dealers | 4.00- 4.25 |
| Buffalo | 9.25- 9.75 |
| Chicago, net | 6.50- 7.00 |
| Cincinnati, dealers | 6.50- 7.00 |
| Detroit, net | 6.00- 6.50 |
| Eastern Pa. | 8.50- 9.00 |
| N. Y., deal. fdry. | 6.00 |
| St. Louis | 5.50- 6.00 |

**COUPLERS, SPRINGS**

| | |
|---|---|
| Buffalo | 13.25-13.75 |
| Chicago, springs | 13.00-13.50 |
| Eastern Pa. | 14.50-15.00 |
| Pittsburgh | 14.50-15.00 |
| St. Louis | 10.50-11.00 |

**ANGLE BARS—STEEL** ☐

| | |
|---|---|
| Chicago | 13.00-13.50 |
| St. Louis | 11.00-11.50 |

**RAILROAD SPECIALTIES**

| | |
|---|---|
| Chicago | 12.50-13.00 |

**LOW PHOSPHORUS**

| | |
|---|---|
| Buffalo, billets and bloom crops | 13.25-13.75 |
| Cleveland, billet, bloom crops | 15.00-15.50 |
| Eastern Pa., crops | 15.00-15.50 |
| Pittsburgh, billet, bloom crops | 15.00-15.50 |
| Pittsburgh, sheet bar crops | 14.00-14.50 |

**FROGS, SWITCHES** ☐ ☐

| | |
|---|---|
| Chicago | 11.50-12.00 |
| St. Louis, cut | 10.50-11.00 |

**SHOVELING STEEL** ☐ ☐

| | |
|---|---|
| Chicago | 11.50-11.75 |
| Federal, Ill. | 8.25- 8.75 |
| Granite City, Ill. | 7.50- 8.00 |

**RAILROAD WROUGHT** ☐

| | |
|---|---|
| Birmingham | 7.50- 8.00 |
| Boston, dealers | 6.00- 6.50 |
| Buffalo, No. 1 | 10.00-10.50 |
| Buffalo, No. 2 | 12.00-12.50 |
| Chicago, No. 1, net | 10.50-11.00 |
| Chicago, No. 2 | 11.50-11.75 |
| Cincinnati, No. 2 | 9.00- 9.50 |
| Eastern Pa. | 11.50-12.00 |
| N. Y., No. 1, deal. | 7.00- 7.50 |
| St. Louis, No. 1 | 7.00- 7.50 |
| St. Louis, No. 2 | 9.75-10.25 |

**SPECIFICATION PIPE** ☐

| | |
|---|---|
| Boston | 3.00- 3.25 |
| Eastern Pa. | 9.50-10.00 |
| New York, dealers | 3.50- 4.00 |

**BUSHELING** ☐ ☐

| | |
|---|---|
| Buffalo, No. 1 | 10.50-11.00 |
| Chicago, No. 1 | 10.25-10.75 |
| Cinci., No. 1, deal. | 7.00- 7.50 |
| Cincinnati, No. 2 | 3.50- 4.00 |
| Cleveland, No. 2 | 8.00- 8.50 |
| Detroit, No. 1, new | 8.50- 9.00 |
| Valleys, new, No. 1 | 12.50-13.00 |

**MACHINE TURNINGS** ☐

| | |
|---|---|
| Birmingham | 4.50- 5.00 |
| Boston, dealers | 3.00- 3.25 |
| Buffalo | 6.00- 6.50 |
| Chicago | 6.50- 7.00 |
| Cincinnati, dealers | 4.50- 5.00 |
| Cleveland | 7.50- 8.00 |
| Detroit | 5.50- 6.00 |
| Eastern Pa. | 6.50- 7.00 |
| New York, dealers | 3.50- 3.75 |
| Pittsburgh | 9.00- 9.50 |
| St. Louis | 3.50- 4.00 |
| Valleys | 9.00- 9.50 |

**BORINGS AND TURNINGS** ☐

*For Blast Furnace Use*

| | |
|---|---|
| Boston, dealers | 3.25- 3.50 |
| Buffalo | 6.50- 7.00 |
| Cincinnati, dealers | 4.50- 5.00 |
| Cleveland | 8.00- 8.50 |
| Detroit | 5.75- 6.25 |
| Eastern Pa. | 5.00 |
| New York, dealers | 1.50- 1.75 |
| Pittsburgh | 6.75- 7.25 |

**CAST IRON BORINGS**

| | |
|---|---|
| Birmingham, plain | 4.50- 5.00 |
| Boston, chemical | 8.50- 9.00 |
| Boston, dealers | 3.25- 3.50 |
| Buffalo | 6.50- 7.00 |
| Chicago | 6.50- 7.00 |
| Cincinnati, dealers | 4.00- 4.50 |
| Cleveland | 8.00- 8.50 |
| Detroit | 5.75- 6.25 |
| E. Pa., chemical | 12.00-13.00 |
| New York, dealers | 1.50- 1.75 |
| Pittsburgh | 6.75- 7.25 |
| St. Louis | 3.00- 3.50 |

**PIPE AND FLUES** ☐ ☐

| | |
|---|---|
| Cincinnati, dealers | 5.50- 6.00 |

**RAILROAD GRATE BARS** ☐

| | |
|---|---|
| Buffalo | 7.00- 7.50 |
| Chicago, net | 6.00- 6.50 |
| Cincinnati | 5.50- 6.00 |
| Eastern Pa. | 9.00 |
| New York, dealers | 4.00- 4.50 |
| St. Louis | 4.50- 5.00 |

**FORGE FLASHINGS** ☐ ☐

| | |
|---|---|
| Boston, dealers | 6.00- 6.25 |
| Buffalo | 10.50-11.00 |
| Cleveland | 9.50-10.00 |
| Detroit | 8.00- 8.50 |

**FORGE SCRAP** ☐ ☐

| | |
|---|---|
| Boston, dealers | 5.00- 5.25 |
| Chicago, heavy | 12.50-13.00 |
| Eastern Pa. | 9.50-10.00 |

**ARCH BARS, TRANSOMS**

| | |
|---|---|
| St. Louis | 12.25-12.75 |

**AXLE TURNINGS** ☐ ☐

| | |
|---|---|
| Boston, dealers | 3.00- 3.50 |
| Buffalo | 7.50- 8.00 |
| Chicago, elec. fur. | 10.50-11.00 |
| Cleveland | 8.00- 8.50 |
| Eastern Pa. | 9.50-10.00 |
| St. Louis | 6.50- 7.00 |

**STEEL CAR AXLES** ☐ ☐

| | |
|---|---|
| Birmingham | 12.50-13.00 |
| Boston, ship. point. | 10.00-10.50 |
| Buffalo | 13.25-13.75 |
| Chicago, net | 16.00-16.50 |
| Eastern Pa. | 16.50-17.00 |
| St. Louis | 14.00-14.50 |

**SHAFTING** ☐ ☐

| | |
|---|---|
| Boston, ship. point. | 12.25-12.50 |
| Eastern Pa. | 17.50 |
| New York, dealers | 11.50-12.00 |
| St. Louis | 11.50-12.00 |

**CAR WHEELS** ☐ ☐

| | |
|---|---|
| Birmingham | 9.00- 9.50 |
| Boston, iron deal. | 6.00- 6.50 |
| Buffalo, iron | 11.00-11.50 |
| Buffalo, steel | 13.00-13.50 |
| Chicago, iron | 12.00-12.50 |
| Chicago, rolled steel | 12.50-13.00 |
| Cincinnati, iron | 9.00- 9.50 |
| Eastern Pa., iron | 10.50-11.00 |
| Eastern Pa., steel | 14.50-15.00 |
| Pittsburgh, iron | 12.50-13.00 |
| Pittsburgh, steel | 14.50-15.00 |
| St. Louis, iron | 8.75- 9.25 |
| St. Louis, steel | 10.50-11.00 |

**No. 1 CAST SCRAP** ☐ ☐

| | |
|---|---|
| Birmingham | 9.50-10.00 |
| Boston, No. 1 mach. | 8.50- 9.00 |
| Boston, No. 2 | 7.50 |
| Boston, tex. con. | 8.50- 9.00 |
| Buffalo, cupola | 10.50-11.00 |
| Buffalo, mach. | 12.00-12.50 |
| Chicago, agri. net | 9.50-10.00 |
| Chicago, auto | 10.50-11.00 |
| Chicago, mach net | 11.00-11.50 |
| Chicago, railr'd net | 10.00-10.50 |
| Cinci., mach. cup | 9.50-10.00 |
| Cleveland, cupola | 12.50-13.00 |
| Detroit, net | 9.50-10.00 |
| Eastern Pa., cupola | 11.50-12.50 |
| Pittsburgh, cupola | 13.50-14.00 |
| San Francisco, del. | 13.50-14.00 |
| Seattle | 7.00- 8.50 |
| St. Louis, No. 1 | 9.00- 9.50 |
| St. L., No. 1 mach. | 10.25-10.75 |

**HEAVY CAST** ☐ ☐

| | |
|---|---|
| Boston, del. | 6.00- 6.25 |
| Buffalo, break. | 9.00- 9.50 |
| Cleveland, break. | 9.50-10.00 |
| Detroit, auto net | 10.50 |
| Detroit, auto net | 9.50-10.00 |
| Eastern Pa. | 11.00 |
| N. Y. break. deal. | 6.50- 6.75 |
| Pittsburgh | 12.50-13.00 |

**MALLEABLE** ☐ ☐

| | |
|---|---|
| Boston, consum. | 10.00-10.50 |
| Buffalo | 12.75-13.25 |
| Chicago, R. R. | 13.00-13.50 |
| Cincinnati, agri. del. | 9.00- 9.50 |
| Cleveland, rail | 13.00-13.50 |
| Detroit, auto | 11.00-11.50 |
| St. Louis, R. R. | 10.00-10.50 |
| Eastern Pa., R. R. | 11.00-11.50 |

**RAILS FOR ROLLING** ☐

*5 feet and over*

| | |
|---|---|
| Birmingham | 11.00-11.50 |
| Boston, dealers | 8.00- 8.50 |
| Buffalo | 12.00-12.50 |
| Chicago | 12.50-13.00 |
| Eastern Pa. | 12.50-13.00 |
| New York, dealer | 7.50- 8.00 |
| St. Louis | 10.75-11.25 |

**LOCOMOTIVE TIRES** ☐

| | |
|---|---|
| Chicago (cut) | 12.50-13.00 |
| St. Louis, No. 1 | 10.00-10.50 |

**LOW PHOS. PUNCHINGS** ☐

| | |
|---|---|
| Buffalo | 13.25-13.75 |
| Chicago | 13.50-14.00 |
| Eastern Pa. | 14.50-15.00 |
| Pittsburgh | 14.50-15.00 |

# Nonferrous Metal Prices of the Week

*Spot unless otherwise specified.  Cents per pound*

| | Copper: Electro., del. Conn. | Copper: Lake, del. Midwest | Copper: Casting, refinery | Straits Tin: New York Spot | Straits Tin: New York Futures | Lead: N. Y. | Lead: East St. L. | Zinc: St. L. | Aluminum 99% | Antimony Spot, N. Y. | Nickel Cathodes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Feb. 2 | 9.00 | 9.12½ | 7.50 | 51.00 | 50.50 | 3.50 | 3.35 | 3.70 | *19.00 | 14.50 | 35.00 |
| Feb. 4 | 9.00 | 9.12½ | 7.50 | 51.05 | 50.55 | 3.50 | 3.35 | 3.70 | *19.00 | 14.50 | 35.00 |
| Feb. 5 | 9.00 | 9.12½ | 7.50 | 51.00 | 50.60 | 3.50 | 3.35 | 3.70 | *19.00 | 14.50 | 35.00 |
| Feb. 6 | 9.00 | 9.12½ | 7.50 | 51.12½ | 50.65 | 3.50 | 3.35 | 3.70 | *19.00 | 14.50 | 35.00 |
| Feb. 7 | 9.00 | 9.12½ | 7.50 | 51.20 | 50.65 | 3.50 | 3.35 | 3.70 | *19.00 | 14.50 | 35.00 |
| Feb. 8 | 9.00 | 9.12½ | 7.50 | 51.10 | 50.55 | 3.50 | 3.35 | 3.70 | *19.00 | 14.50 | 35.00 |

*Nominal range 19.00c to 21.00c.

# Warehouse Iron and Steel Prices

*Cents per pound for delivery within metropolitan districts of cities specified*

**STEEL BARS**

| | |
|---|---|
| Baltimore* | 2.90c |
| Boston†† | 2.95c |
| Buffalo | 3.00c |
| Chattanooga | 3.31c |
| Chicago | 2.95c |
| Cincinnati | 3.15c |
| Cleveland | 2.95c |
| Detroit | 3.03½c |
| Houston | 3.00c |
| Los Angeles | 3.70c |
| Milwaukee | 3.06c |
| New Orleans | 3.30c |
| New York‡(d) | 3.22c |
| Pittsburgh(h) | 2.90c |
| Philadelphia* | 2.90c |
| San Francisco | 3.60c |
| Seattle | 3.60c |
| St. Louis | 3.19c |
| St. Paul | 3.00c |
| Tulsa | 3.25c |

**IRON BARS**

| | |
|---|---|
| Portland | 3.40c |
| Chattanooga | 3.31c |
| Baltimore* | 3.00c |
| Chicago | 2.75c |
| Cincinnati | 3.15c |
| New York‡(d) | 3.32c |
| Philadelphia* | 2.90c |
| St. Louis | 3.19c |
| Tulsa | 3.25c |

**REINFORCING BARS**

| | |
|---|---|
| Buffalo | 2.60c |
| Chattanooga | 3.31c |
| Chicago | 2.10c-2.60c |
| Cleveland(c) | 1.97½c |
| Cincinnati | 3.25c |
| Houston | 3.25c |
| Los Ang., cl. | 2.15c |
| New Orleans | 3.50c |
| Pitts., plain(h) | 3.05c |
| Pitts., twisted squares (h) | 3.175c |
| San Francisco | 2.45c |
| Seattle | 3.50c |
| St. Louis | 3.24c |
| Tulsa | 3.25c |
| Young. | 2.30c-2.60c |

**SHAPES**

| | |
|---|---|
| Baltimore* | 2.95c |
| Boston†† | 3.17c |
| Buffalo | 3.25c |
| Chattanooga | 3.56c |
| Chicago | 3.20c |
| Cincinnati | 3.40c |
| Cleveland | 3.31c |
| Detroit | 3.40c |
| Houston | 3.00c |
| Los Angeles | 3.70c |
| Milwaukee | 3.31c |
| New Orleans | 3.55c |
| New York(d) | 3.37c |
| Philadelphia* | 2.95c |
| Pittsburgh(h) | 3.15c |
| Portland | 3.55c |
| San Francisco | 3.55c |
| Seattle | 3.55c |
| St. Louis | 3.44c |
| St. Paul | 3.25c |
| Tulsa | 3.50c |

**PLATES**

| | |
|---|---|
| Baltimore* | 2.95c |
| Boston†† | 3.18c |
| Buffalo | 3.37c |
| Chattanooga | 3.56c |
| Chicago | 3.20c |
| Cincinnati | 3.40c |
| Cleveland, ¼-in. and over | 3.31c |
| Detroit | 3.40c |
| Detroit, 3/16-in. | 3.65c |
| Houston | 3.00c |
| Los Angeles | 3.70c |
| Milwaukee | 3.31c |
| New Orleans | 3.55c |
| New York(d) | 3.40c |
| Philadelphia* | 2.95c |
| Phila. floor | 4.95c |
| Pittsburgh(h) | 3.15c |
| Portland | 3.55c |
| San Francisco | 3.55c |
| Seattle | 3.55c |
| St. Louis | 3.44c |
| St. Paul | 3.25c |
| Tulsa | 3.50c |

**NO. 10 BLUE**

| | |
|---|---|
| Baltimore* | 3.05c |
| Boston†† | 3.25c |
| Buffalo | 3.62c |
| Chattanooga | 3.36c |
| Chicago | 3.05c |
| Cincinnati | 3.20c |
| Cleveland | 3.11c |
| Det., 8-10 ga. | 3.13½c |
| Houston | 3.35c |
| Los Angeles | 3.80c |
| Milwaukee | 3.16c |
| New Orleans | 3.55c |
| New York | 3.27c |
| Portland | 3.75c |
| Philadelphia* | 3.05c |
| Pittsburgh(h) | 2.95c |
| San Francisco | 3.75c |
| Seattle | 3.75c |
| St. Louis | 3.29c |
| St. Paul | 3.45c |
| Tulsa | 3.70c |

**NO. 24 BLACK**

| | |
|---|---|
| Baltimore*† | 3.51c |
| Boston (g) | 3.90c |
| Buffalo | 3.25c |
| Chattanooga | 4.21c |
| Chicago | 3.85c |
| Cincinnati | 4.05c |
| Cleveland | 3.91c |
| Detroit | 3.98½c |
| Los Angeles | 4.45c |
| Milwaukee | 3.96c |
| New York | 3.85c |
| Philadelphia*† | 3.55c |
| Pitts.** (h) | 3.55c |
| Portland | 4.40c |
| San Francisco | 4.40c |
| Seattle | 4.40c |
| St. Louis | 4.09c |
| St. Paul | 3.695c |
| Tulsa | 4.75c |

**NO. 24 GALV. SHEETS**

| | |
|---|---|
| Baltimore*† | 4.21c |
| Buffalo | 4.00c |
| Boston (g) | 4.60c |
| Chattanooga | 4.86c |
| Chicago (h) | 4.55c |
| Cincinnati | 4.70c |
| Cleveland | 4.61c |
| Detroit | 4.70c |
| Houston | 4.40c |
| Los Angeles | 5.05c |
| Milwaukee | 4.66c |
| New Orleans | 4.95c |
| New York | 4.50c |
| Philadelphia*† | 4.25c |
| Pitts.** (h) | 4.15-4.45c |
| Portland | 5.00c |
| San Francisco | 5.00c |
| Seattle | 5.00c |
| St. Louis | 4.79c |
| St. Paul | 4.19c |
| Tulsa | 5.10c |

**BANDS**

| | |
|---|---|
| Baltimore* | 3.15c |
| Boston†† | 3.25c |
| Buffalo | 3.42c |
| Chattanooga | 3.61c |
| Chicago | 3.30c |
| Cincinnati | 3.45c |
| Cleveland | 3.36c |
| Detroit, 3/8-in. and lighter | 3.38½c |
| Houston | 3.25c |
| Los Angeles | 3.90c |
| Milwaukee | 3.41c |
| New Orleans | 3.59c |
| New York(d) | 3.62c |
| Philadelphia | 3.15c |
| Pittsburgh(h) | 3.20c |
| Portland | 3.90c |
| San Francisco | 4.05c |
| Seattle | 3.90c |
| St. Louis | 3.54c |
| St. Paul | 3.20c |
| Tulsa | 3.45c |

**HOOPS**

| | |
|---|---|
| Baltimore | 2.30c |
| Boston | 4.25c |
| Buffalo | 3.42c |
| Chicago | 3.30c |
| Cincinnati | 3.45c |
| Det., No. 14 and lighter | 3.38½c |
| Milwaukee | 3.41c |
| New York | 3.62c |
| Philadelphia | 3.40c |
| Pittsburgh(h) | 3.70c |
| Seattle | 5.60c |
| St. Louis | 3.54c |
| St. Paul | 3.75c |

**COLD. FIN. STEEL**

| | |
|---|---|
| Baltimore (c) | 3.71c |
| Boston | 3.85c-4.00c |
| Buffalo (h) | 3.55c |
| Chattanooga* | 4.06c |
| Chicago (h) | 3.50c |
| Cincinnati | 3.70c |
| Cleveland (h) | 3.50c |
| Detroit | 3.63½c |
| Los Ang.(f)(d) | 4.95c |
| Milwaukee | 3.61c |
| New Orleans | 4.30c |
| New York | 3.92c-4.42c |
| Philadelphia | 3.73c |
| Pittsburgh(h) | 3.45c |
| Portland (f) | 4.75c |
| San Fran.(f)(d) | 5.95c |
| Seattle(f) (d) | 4.75c |
| St. Louis | 3.74c |
| St. Paul | 3.20c |
| Tulsa | 4.65c |

**COLD ROLLED STRIP**

| | |
|---|---|
| Boston, 0.100-in., 500 lb. lots | 5.35c |
| Buffalo | 3.39c |
| Chicago | 3.27c |
| Cincinnati(b) | 3.42c |
| Cleveland (b) | 3.20c |
| Detroit | 3.33c |
| New York | 4.70c |
| St. Louis | 3.36c |

**TOOL STEELS**

(Applying on or east of Mississippi river; west of Mississippi 1c up)

| | Base |
|---|---|
| High speed | 57c |
| High carbon, high chrome | 37c |
| Oil hardening | 22c |
| Special tool | 20c |
| Extra tool | 17c |
| Regular tool | 14c |

Uniform extras apply

(b) Plus straightening, cutting and quantity differentials; (c) Plus mill, size and quantity extras; (d) Minus quant. diff.; (e) New mill classif.; (f) Rounds only; (g) 50 bundles or over; (h) Outside delivery, 10c less.

‡Domestic bars; *Plus quan. extras; **Under 25 bundles; *†50 or more bundles; †New extras apply; ††Base 40,000 lbs. extras on less.

Prices on heavier lines are subject to new quantity differentials; 399 lbs. and less, up 50 cts.; 400 to 9999 lbs., base; 10,000 to 19,999 lbs., 15 cts. under; 20,000 to 39,999 lbs., 25 cts. under; 40,000 lbs. and over, 35 cts. under base.

# Current Iron and Steel Prices of Europe

**Dollars at Rates of Exchange, Feb. 7**

Export Prices f. o. b. Ship at Port of Dispatch—By Cable (or Radio)

| | British gross tons U. K. ports £ s d | Continental Channel or North Sea ports, metric tons Quoted in dollars at current value | **Quoted in gold pounds sterling £ s d |
|---|---|---|---|
| **PIG IRON** | | | |
| Foundry, 2.50-3.00 Silicon | $15.01 3 1 6 | $13.78 | 1 14 0 |
| Basic bessemer | 13.42 2 15 0* | 12.97 | 1 12 0 |
| Hematite, Phos. .03-.05 | 15.25 3 2 6 | ..... | ..... |
| **SEMIFINISHED STEEL** | | | |
| Billets | $26.84 5 10 0 | $19.04 | 2 7 0 |
| Wire rods, No. 5 gage | 38.06 7 16 0 | 36.49 | 4 10 0 |
| **FINISHED STEEL** | | | |
| Standard rails | $37.82 7 15 0 | $44.60 | 5 10 0 |
| Merchant bars | 1.63c 2 10 0 | 1.15c to 1.20c | 3 2 6 to 3 5 0 |
| Structural shapes | 1.60c 7 7 6 | 1.13c | 3 1 6 |
| Plates, †¼ in. or 5 mm. | 1.74c 8 0 0 | 1.51c | 4 2 6 |
| Sheets, black, 24 gage or 0.5 mm. | 2.01c 9 5 0 | 2.13c | 5 16 0†† |
| Sheets, gal., 24 gage, corr. | 2.44c 11 5 0 | 2.58c | 6 10 0 |
| Bands and strips | 1.84c 8 10 0 | 1.46c | 4 0 0 |
| Plain wire, base | 2.01c 9 5 0 | 1.96c | 5 7 6 |
| Galvanized wire, base | 2.44c 11 5 0 | 2.30c to 2.33c | 6 5 6 to 6 7 6 |
| Wire nails, base | 2.60c 12 0 0 | 2.11c | 5 15 0 |
| Tin plate, box 108 lbs. | $ 4.39 0 18 2 | ..... | ..... |

British ferromanganese $85 delivered Atlantic seaboard, duty-paid. German ferromanganese £9 6s 0d $(43.74) f.o.b.

Domestic Prices at Works or Furnace—Last Reported

| | £ s d | | French Francs | | Belgian Francs | | Reich Marks |
|---|---|---|---|---|---|---|---|
| Fdy. pig iron, Si. 2.5 | $16.47 3 7 6(a) | $17.08 | 260 | $14.41 | 310 | $24.79 | 62 |
| Basic bessemer pig iron | 16.47 3 7 6(a)* | 12.15 | 185 | 13.02 | 280 | 27.79 (b) | 69.50 |
| Furnace coke | 4.27 0 17 6 | 7.88 | 120 | 5.12 | 110 | 7.60 | 19 |
| Billets | 26.84 5 10 0 | 28.25 | 430 | 20.46 | 440 | 38.58 | 96.50 |
| Standard rails | 1.79c 8 5 0 | 2.08c | 694 | 2.31c | 1,100 | 2.39c | 132 |
| Merchant bars | 1.87c 8 12 0 | 1.68c | 560 | 1.16c | 550 | 1.99c | 110 |
| Structural shapes | 1.90c 8 15 0 | 1.65c | 550 | 1.16c | 550 | 1.95c | 107.50 |
| Plates, †¼-in. or 5 mm. | 1.97c 9 1 3 | 2.10c | 700 | 1.47c | 700 | 2.30c | 127 |
| Sheets, black | 2.28c 10 10 0§ | 2.55c | 850‡ | 1.63c | 775‡ | 2.61c | 144‡ |
| Sheets, galv., corr., 24 ga. or 0.5 mm. | 2.82c 13 0 0 | 4.50c | 1,500 | 3.15c | 1,500 | 6.70c | 370 |
| Plain wire | 2.01c 9 5 0 | 3.15c | 1,050 | 2.31c | 1,100 | 3.13c | 173 |
| Bands and strips | 2.03c 9 7 0 | 1.95c | 650 | 1.47c | 700 | 2.30c | 127 |

*Basic. †British ship-plates. Continental, bridge plates. 24 ga. ‡1 to 3 mm. basic price British quotations are for basic open-hearth steel. Continental usually for basic-bessemer steel a del. Middlesbrough. b hematite. ††Close annealed

**Gold pound sterling carries a premium of 66.47 per cent over paper sterling.

# Bars

Bar Prices, Page 60

**Chicago**—While automotive bar demand has not improved orders from miscellaneous consumers are heavier and total business has shown a further small gain. Automotive and farm implement interests continue the best consumers and indications are that requirements of these two groups will be well maintained during the balance of the quarter. Bar producers usually can give fairly prompt delivery, though in some instances delays are encountered. Backlogs on certain sizes assure heavy operations at least into March.

**Pittsburgh**—No decline in merchant bar buying has been noted. The carbon bar market holds steady at 1.80c, Pittsburgh, and alloy bars at 2.45c, Pittsburgh. Forging quality bars are in heavy demand.

**Cleveland**—Business is leveling off and some producers believe the peak in automotive demand has been reached, at least until the second quarter. New commitments last week were more notable for diversity than improvement in tonnage. These miscellaneous orders are relatively small. The Cleveland bar mill last week operated at 50 per cent. No change in price is indicated for second quarter.

**Boston**—Forging and alloy bar shipments are light, although consumers are buying more frequently. Award of 154,000 pounds, hot rolled nickel-steel 1-inch round bars for the Boston navy yard has been made to the Republic Steel Corp., Youngstown, O., at 4.33c, delivered. Commercial steel bars are steady at 2.20c, Boston.

**New York**—Railroad repair activities are adding some stimulus to demand for steel bars, although the bar market as a whole continues to lag, particularly on jobber specifications.

**Philadelphia** — Commercial steel bar specifications are little more than maintained, with releases generally covering only immediate requirements. Common iron bars also are moving slowly. Steel bars are 1.80c, Pittsburgh, or 2.09c, Philadelphia, and common iron bars, 1.70c, Pitsburgh, or 1.99c, Philadelphia.

## Cold Finished

Cold Finished Prices, Page 61

**Pittsburgh**—Cold-drawn bar specifications have declined. Most noticeable was an interruption in automotive buying. However, as most of this originates on a few days' notice and immediate shipments are requested, the lull may be temporary. No change appears likely from 2.10c, Pittsburgh, for carbon cold-drawn bars, or 2.95c, Pittsburgh, for alloy quality.

# Plates

Plate Prices, Page 60

**Pittsburgh** — Approximately 625 tons of steel plates are now being fabricated in the Neville Island yards of Dravo Contracting Co. for two 130 x 34 x 14-foot steel coal barges for the Pennsylvania railroad. American Bridge Co. at its Ambridge, Pa., shops is now repairing the first of a lot of 20 Carnegie Steel Co. barges, which will take about 700 tons of plates. Gulf Refining Co., Port Arthur, Tex., recently placed about 205 tons of plates for 14 small shop fabricated tanks with Petroleum Iron Works, Sharon, Pa. In the market for river barges at least two inquiries for ten barges each are noted, but one is conditional upon the buyer's receipt of a coal hauling contract, and the other asks the barge builder to finance over a four-year period. Pittsburgh-Des Moines Steel Co., Pittsburgh, has been awarded a contract for one hot well for the federal store house, Charleroi, Pa., on its recent bid of $462.

**Cleveland**—Currently, this is the quietest market in finished steel, the Cleveland mill operating at about 30 per cent on small, miscellaneous orders. Wheeling & Lake Erie purchased 500 to 600 tons of steel, mainly plates, for freight car repairs. Sellers say orders and specifications from fabricators, which showed encouraging improvement in January, have declined.

**Chicago**—Plate demand from miscellaneous sources is increasing gradually, while slightly heavier buying is appearing for railroad repairs. Largest orders and pending work principally are for federal projects. Requirements of structural fabricators are steady, but relatively light. Commonwealth Edison Co. is asking for bids on transportation of coal over the Illinois waterway. The recipient of this contract may be required to purchase barges for carrying this traffic.

**Boston**—Plate demand is gradually improving, with railroads and construction contributing little. Most orders are for small lots, for quick delivery. Bids close Feb. 19 on boiler plate steel for four destroyers being built at the Boston navy yard, and Feb. 15 on corrosion-resisting plates for the same ships.

**New York**—Plate demand shows little change from last week. The most important inquiry is for 1800 tons for two large steel pipe projects in New York.

**Philadelphia**—Plate orders are fairly numerous, and still include some specifications for ship repairs, but light railroad buying and building construction is still being seriously felt by platemakers. Tank work includes a water tank for the Frankford arsenal, here, on which bids were opened Feb. 7. Plates are unchanged at 1.90c, Coatesville, Pa., or 1.98½c, Philadelphia.

Bids will be asked March 7 by the United States engineer here on construction of a 50-foot steel hull tug.

**San Francisco**—Western Pipe & Steel Co., Los Angeles, recently took 350 tons of plates additional for a 30-inch pipe line for the metropolitan water district, Los Angeles. Bids will be called soon for the Hetch Hetchy bay crossing pipe line for San Francisco, involving about 1500 tons.

**Seattle**—Interest centered this week in opening of bids by Tacoma for 10,777 feet of 42-inch steel pipe and 34,091 feet of steel or concrete 54-inch water main. Puget Sound Machinery Depot, Seattle, is low at $538,091 for painted steel pipe and American Concrete Pipe Co. is low at $526,224 for lock-joint concrete. Approximately 4000 tons of plates are involved.

## Contracts Placed

625 tons, two 130 x 34 x 14-foot steel coal barges, for Pennsylvania railroad, to Dravo Contracting Co., Neville Island, Pittsburgh.

205 tons, 14 pressure tanks, Gulf Refining Co., Port Arthur, Tex., to Petroleum Iron Works, Sharon, Pa.

175 tons, three asphalt tanks, Ashland Refining Co., Catlettsburg, Ky., to Chicago Bridge & Iron Works, Chicago.

110 tons, steel shell, Manitowoc Boiler Co., Rapids, Wis., owners to fabricate.

## Contracts Pending

4000 tons, 42 and 54-inch water main improvement, Tacoma, Wash.; Puget Sound Machinery Depot, Seattle, low.

100 tons, two barges for army engineers, Washington; Treadwell Construction Co., Midland, Pa., low.

Unstated tonnage, water tank, Frankford arsenal, Philadelphia; bids opened Feb. 7.

Unstated tonnage, 200,000-gallon standpipe, Sauquoit, N. Y.; bids Feb. 12.

# Transportation

**Track Material Prices, Page 61**

Placing of rail tonnages continues, the Chicago, Burlington & Quincy awarding 16,000 tons, with about 8000 tons of fastenings yet to be placed, and the St. Louis-San Francisco 15,000 tons. Pacific Railway Supply Co., Seattle, has submitted the low bid for 1000 tons of relaying rail for Seattle, at $18.72 per gross ton.

An eastern seaboard line is expected momentarily to place 5000 tons of rails.

Prospective rail buying is indicated by the New York Central, Chesapeake & Ohio and Erie. Carnegie Steel Co., Pittsburgh, has suspended rail rolling at its Edgar Thompson works after completing its February deliveries.

Domestic freight car awards in January, 24 cars, were the lightest since September, 1934, when only seven were placed. Awards in December, 1934, were 110 cars and in January, 1934, they were 152 cars. Further comparisons are as follows:

| | 1935 | 1934 | 1933 | 1932 |
|---|---|---|---|---|
| Jan. | 24 | 152 | 3 | 159 |
| Feb. | | 19,725 | 0 | 35 |
| March | | 30 | 5 | 105 |
| April | | 800 | 50 | 0 |
| May | | 717 | 8 | 60 |
| June | | 1,835 | 500 | 0 |
| July | | 19 | 306 | 25 |
| Aug. | | 105 | 202 | 5 |
| Sept. | | 7 | 23 | 1,298 |
| Oct. | | 75 | 514 | 0 |
| Nov. | | 254 | 533 | 2 |
| Dec. | | 110 | 316 | 50 |
| Total | | 23,829 | 2,460 | 1,739 |

Brooklyn-Manhattan Transit Corp., New York, is asking alternative bids on 25 and 30 multisection articulated subway train units.

Cincinnati, New Orleans & Texas Pacific has 500 cars pending and Baltimore & Ohio 50 to 150 cars. Norfolk & Western will air condition and remodel eight passenger cars in its own shops and Louisville & Nashville has ordered air-conditioning equipment for 25 sleeping and parlor cars and five diners.

Some stimulation to purchase of rolling stock and car repairs may result from an act just signed by the President providing for extension of RFC and creating a fund of $350,000,000 to aid railroad financing. A new division of RFC may be created to handle equipment loan applications.

## Car Orders Placed

Chesapeake & Ohio, five 50-ton hopper cars, to Bethlehem Steel Co., Bethlehem, Pa.

Liquid Carbonic Corp., Chicago, five steel sheathed 40-ton box cars, to American Car & Foundry Co., New York.

Niacet Chemicals Corp., Niagara Falls, N. Y., three tank cars, to American Car & Foundry Co., New York.

## Rail Orders Placed

Chicago, Burlington & Quincy, 16,000 tons, as follows: 7700 tons to Illinois Steel Co., Chicago; 4300 tons to Inland Steel Co., Chicago; 4000 tons to Colorado Fuel & Iron Co., Denver.

St. Louis-San Francisco, 15,000 tons to Tennessee Coal, Iron & Railroad Co., Birmingham, Ala.

# Sheets

**Sheet Prices, Page 60**

**Pittsburgh**—Aside from the heavy call for prompt shipment on full-finished autobody sheets, the market reflects a better tone in sheet buying by manufacturers of stoves, steel lockers and makers of agricultural implements. Full-finished sheet mill operations are close to 80 per cent. Follansbee Bros. Co. is considering reopening its Toronto, O., sheet mills, closed for several years.

**Cleveland**—Sheet producers in this district do not expect any change in prices for second quarter. Owing to the short month, new quotations will have to be filed with the Iron and Steel institute Feb. 18. Though base prices have been firm, buyers have been breaking down extras, especially for guaranteed deep-drawing quality, by voluntarily assuming responsibility for quality, whereas if the mills were held responsible the extras would have to be paid. Seventy-five per cent of the output from mills in this district, continuing to work at capacity, is going to automobile manufacturers. Sellers note improved demand from makers of steel barrels, signs, tables, and refrigerator and washing machines.

**Chicago**—Sheet producers are in a fairly comfortable position as regards backlogs, and in some descriptions can accept but little additional business for this quarter. This situation applies principally to wide cold-rolled sheets. Galvanized sheets are slightly more active. Shipments to the automotive industry continue heavy.

**Boston**—Sheet demand is steady, with delivery delayed on some finishes. Inquiry has broadened, and small tank requirements are better than expected.

**New York** — Sheet sellers are practically out of the market for cold-finished steel for the automobile industry, and are having difficulty in making deliveries of hot rolled products. Some district offices here have to refer all orders to the home office before acceptance. Prices are unchanged.

**Philadelphia** — Sheet demand continues to broaden, although most sellers are out of the market on autobody material. Prices are unchanged.

**Cincinnati** — Sheet mills in this district are near capacity and may soon close books for this quarter on cold-rolled material. Automobile demand represents an abnormally large percentage, but other buying is improving.

**St. Louis**—Steel sheet demand has continued the improvement noted during the final week of January. New requirements are diversified, and indications point to heavier shipments this month. Common black sheets and galvanized sheets continued active.

**Birmingham, Ala.**—Sheet mill operations are steady. Wholesale hardware dealers and others are replenishing stocks.

**San Francisco** — American Sheet & Tin Plate Co. has been awarded 12,050 pounds of corrosion-resisting steel sheets for delivery at the navy yard here, at $5896.35, bids Jan. 25, schedule 4053, bureau of supplies and accounts.

# Strip Steel

**Strip Prices, Page 61**

**Pittsburgh** — Specifications for strip steel are lighter, following heavy buying up to Feb. 1. Production in both hot and cold-rolling departments is around 65 per cent. The market continues at 1.85c, Pittsburgh, for hot strip and 2.60c, Pittsburgh, for cold strip.

**Cleveland**—No price changes are in view for second quarter when books are opened Feb. 18, but it is anticipated automobile manufacturers will seek to obtain preferred position for deliveries. Strip mills here continue to operate at capacity and are booked up for the remainder of the quarter on wide material. Narrow hot and cold-rolled strip is offered generally for delivery in two to three weeks. January shipments were about 80 per cent larger than December's. Except for automobile requirements the market is flat.

**Chicago** — Strip producers are unable to give prompt delivery on most grades. Backlogs of cold-rolled material are heavier than on hot-rolled strip though shipments of the latter in some instances are delayed two to

three weeks. Automotive needs predominate, with requirements of smaller consumers showing occasional betterment.

**New York** — Although generally disappointing to sellers, narrow strip continues to move at the somewhat accelerated rate noted a week ago. Demand is diversified and is confined largely to small orders.

**Boston** — Demand for low carbon strip continues backward, notably in narrow widths. Consumers generally are asking quick delivery, frequently in small lots, and most mills accumulate orders for sustained runs with difficulty. Miscellaneous character of buying often presents a problem in accomplishing immediate delivery.

**Philadelphia** — Narrow sizes of hot and cold strip are moving slowly. Practice by a number of consumers of slitting wide sheets is given as one reason for the poor demand for narrow strip. Prices are unchanged.

## Wire

**Wire Prices, Page 61**

**Pittsburgh**—With no further gains reported in buying of wire by the manufacturing trades, the market appeared to have leveled off slightly last week. As yet, the merchant trade is not active and only spotty demand is noted for nails and fencing. On a Pittsburgh base the following carload base prices constitute the market: 2.30c for plain manufacturing wire, 2.90c on high carbon spring wire, $2.60 on nails, and unchanged bases on staples, fencing and fence wire.

West Virginia state road department, Charleston, W. Va., closes Feb. 12 on highway projects requiring slightly more than 100,000 linear feet of wire rope for state highway guard rail.

**Cleveland**—Demand is well sustained, with wire mills in this district averaging 60 per cent. Chief support is coming from automobile manufacturers, and indirectly from spring and nut and bolt makers for automobile accounts. Jobbers' miscellaneous requirements are improving. Several railroads have issued inquiries for fencing, one carrier seeking 15 carloads for delivery this year. Code restrictions prohibit this, and no order was placed for this quarter.

**New York**—Stainless steel drawn wire and stainless steel bars, type 411, will be quotable at 17c, Pittsburgh, a reduction of 1 cent, effective Feb. 11, according to prices filed with the American Iron and Steel institute, New York.

**Chicago**—Manufacturers' wire demand continues heavy and recent gains in shipments are being maintained. Orders are well diversified as to consumers, with needs of the automotive industry predominating. Orders for wire products from jobbers gradually are improving. Mill operations have increased and little difficulty is encountered in giving desired shipments.

**Boston**—Demand for wire products has broadened slightly with manufacturers' wire and some specialties in good demand. Several mills note small gains for rope and cable. Jobbers continue to purchase close to requirements. Wire for manufacturing purposes is generally going directly into consumption with few consumers apparently stocking materially.

**ICE BOATING is one of old man Winter's speediest sports. With full sail set, this swift craft skims over the glassy surface like a huge snowbird taking wing.**

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replaced drop forgings for making these cones for textile machines, resulting in lower cost and better finish. Time per piece 56 seconds. Speed 188 S.F.M. using 2 5/16" round Ultra-Cut.

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**BLISS & LAUGHLIN, INC.**

**HARVEY, ILL.** *Sales Offices in all Principal Cities* **BUFFALO, N.Y.**

# Shapes

**Structural Shape Prices, Page 60**

**Pittsburgh**—The largest new project reported last week was 9000 tons for the Library of Congress extension on which bids will be taken March 1. Structural fabricators believe the downtown Pittsburgh plaza development as well as the Homestead bridge, both part of a recent PWA grant to Allegheny county, amounting to $24,500,000, are nearer the inquiry stage. The plaza development and the Homestead bridge will take about 15,000 tons of structural steel. Plain material continues firm at 1.80c, Pittsburgh.

**Cleveland**—The market is more active, 2150 tons having been awarded here during the week. This includes 1170 tons for a Pittsburgh Plate Glass Co. building, Mount Vernon, O.; 460 tons for two Chesapeake & Ohio railroad bridges; 300 tons for a United Drug Co. building in Boston, through a Cleveland contractor, and Ohio highway bridges. The state also is taking bids on 200 tons. Feb. 15 and 16, for several bridges. A considerable number of small projects are being figured for industrial purposes.

**Chicago** — Structural awards still are made up principally of small bridges, with this type of work prominent in new inquiries. Illinois is taking bids Feb. 19 on 860 tons for bridges, in addition to 2300 tons on which bids closed last week. An armory pending at Minneapolis involves 1200 tons. Private inquiries and orders are light.

**Boston**—Structural steel demand is dull, new inquiry coming out slowly. Low bid, $429,313, on the City hospital building, Worcester, Mass., by the George A. Fuller Co., was ruled defective by the PWA engineer. M. S. Kelleher Co., Boston, is second at $433,257. The project takes about 400 tons.

**New York** — Heavier awards and inquiry for schools feature structural steel demand. Lettings include 8000 tons for an elevated highway section, Manhattan. Schools placed require 1000 tons, while bids closed last week on two others taking 2000 tons. Bates & Rogers Construction Co., New York, is low on grade crossings, Fort Wadsworth, Staten Island, N. Y., taking a substantial tonnage of structural steel.

**Philadelphia** — The reported placing of approximately 1800 tons of structural steel for the local naval aircraft factory is outstanding in the structural market here. Early award of 650 tons of structurals for the north-side postoffice to the George A. Fuller Co., this city, is expected. Shapes are unchanged at 1.90c, Bethlehem, or 2.00½c, Philadelphia.

**San Francisco**—Structural shape lettings were the largest for any week this year, aggregating 1186 tons. Bookings to date, however, are over 10,000 tons below the total

ALAN WOOD STEEL CO. ESTABLISHED "A.W." TRADE MARK 1826 CONSHOHOCKEN, PA.

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## Shape Awards Compared

| | Tons |
|---|---|
| Week ended Feb. 9 | 20,305 |
| Week ended Feb. 2 | 10,052 |
| Week ended Jan. 26 | 7,746 |
| This week in 1934 | 15,549 |
| Weekly average, 1934 | 16,284 |
| Weekly average, 1935 | 14,266 |
| Weekly average, January | 13,660 |
| Total to date, 1934 | 100,496 |
| Total to date, 1935 | 85,594 |

for the same period a year ago. New inquiries include 800 tons for a 40-ton gantry crane for Mare Island, Calif. and 230 tons for a high school in Long Beach, Calif.

**Seattle**—New projects are developing and improved business is in prospect in the Pacific Northwest. The Ebey Slough 240-foot state bridge, near Everett, Wash., will require 230 tons of shapes, bids at Olympia, Feb. 19. McRae Bros., Seattle, general contractors for the Bonneville, Oreg., lock span, have awarded 135 tons of shapes and machinery to Poole & McGonigle, Portland, and Pacific Iron Works, Tacoma.

## Shape Contracts Placed

8000 tons, west-side express highway, Seventy-second to Seventy-ninth streets, Manhattan, New York; 4000 tons to American Bridge Co., Pittsburgh, and 4000 tons to Harris Structural Steel Co., New York; Poirier & McLane Corp., New York, general contractor.

1800 tons, naval aircraft factory, Philadelphia, reported placed through Irwin & Leighton, Philadelphia, to the McClintic-Marshall Corp., Bethlehem, Pa.

1225 tons, bridge, Hampton boulevard, Lafayette river, Norfolk, Va., to American Bridge Co., Pittsburgh; T. A. Loving & Co., Goldsboro, N. C., general contractor.

1170 tons, building for Pittsburgh Plate Glass Co., Mount Vernon, O., to McClintic-Marshall Corp., Bethlehem, Pa.

750 tons, public school 146, department of education, New York, to American Bridge Co., Pittsburgh; Anthony Construction Co., New York, general contractor.

635 tons, highway-railway bridge over intracoastal waterway, Horry county, near Myrtle Beach, S. C., to American Bridge Co., Pittsburgh; MacDougald Construction Co., Atlanta, Ga., general contractor; United States engineer, Charleston, S. C., project.

590 tons, class room building, Fordham university, New York, to Bethlehem Fabricators Inc., Bethlehem, Pa.

570 tons, state highway bridge, St. Louis, to Mississippi Valley Structural Steel Co., Decatur, Ill.

375 tons, bridge, Carnegie, Okla., to J. B. Klein Iron & Foundry Co., Oklahoma City, Okla.

350 tons, bridge, Topeka, Kans., to Missouri Valley Bridge & Iron Co., Leavenworth, Kans.

335 tons, bridge, Newport News, Va., for Chesapeake & Ohio railroad, Cleveland, to Virginia Bridge & Iron Co., Roanoke, Va.

300 tons, building, United Drug Co., Boston, to Rogers Structural Steel Co., Corry, Pa.; through H. K. Ferguson Co., Cleveland.

255 tons, bridge NRH 406-C, Texas county, Oklahoma, to Capital Steel & Iron Co., Oklahoma City.

250 tons, crane for Los Angeles, specification 1530, to Harnischfeger Sales Corp., Milwaukee.

250 tons, bridge, Hardesty, Okla., to Capitol Steel & Iron Co., Oklahoma City, Okla.

225 tons, building, Charles E. Noyes Co., Nevin street, Brooklyn, N. Y., to Lehigh Structural Steel Co., Allentown, Pa.; P. Richard Davis Co. New York, general contractor.

220 tons, state bridge, Franklin county, Ohio, to Wheeling Structural Steel Co., Wheeling, W. Va.

200 tons, bridge, Harrison, Ill., to Midland Structural Steel Co., Chicago.

200 tons, bridge, Townsend, Mont., to Minneapolis-Moline Power Implement Co., Minneapolis.

185 tons, Jurgens building, Oakland, Calif., to Herrick Iron Works, Oakland, Calif.

180 tons, Carpentersville bridge, Kane county, Illinois, to Midland Structural Steel Co., Chicago.

175 tons, bridge, Kenosha county, Wisconsin, to McClintic-Marshall Corp., Bethlehem, Pa.

170 tons, state service building, Exeter, R. I., to Bethlehem Fabricators Inc., Bethlehem, Pa.

150 tons, bridge, Akron, Colo., to American Bridge Co., Pittsburgh.

148 tons, state crossing, Sheridan county, Wyoming, to unnamed interest.

147 tons, state crossing, Yuma and Washington counties, Colorado, to un-


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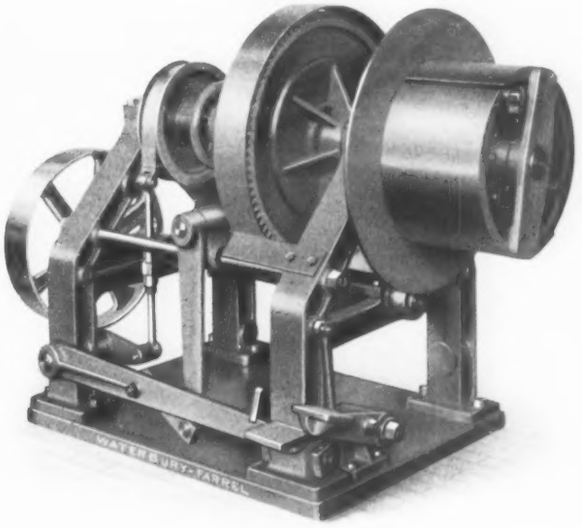


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named interest.

145 tons, platform shelters, Pennsylvania railroad station, Baltimore, to Baltimore Steel Co., Baltimore.

140 tons, alterations for installing electric furnace, Ford Motor Co., Dearborn, Mich., to R. C. Mahon Co., Detroit.

140 tons, special tees, bureau of supplies and accounts, navy department, delivery, Portsmouth, N. H., and Mare Island, Calif., for sumbarines now building, to Bethlehem Steel Co., Bethlehem, Pa.

135 tons, including machinery, Bonneville locks span, Oregon, to Poole & McGonigle, Portland, and Pacific Iron Works, Tacoma; McRae Bros., Seattle, general contractor.

125 tons, bridge near Richmond, Va., for Chesapeake & Ohio railroad, Cleveland, to Jones & Laughlin Steel Corp., Pittsburgh.

125 tons, warehouse, Earl M. Jorgensen Co., Los Angeles, to Pacific Coast Steel Corp., Los Angeles.

120 tons, filter and chile buildings, Gulf Refining Co., Port Arthur, Tex., to Petroleum Iron Works, Sharon, Pa.

110 tons, building for Pacific Coast Borax Co., Los Angeles, to Consolidated Steel Corp., Los Angeles.

110 tons, state highway project 7490, Stokes county, North Carolina, to Bethlehem Fabricators Inc., Bethlehem, Pa.

100 tons, inside framing and boiler supports, Washington state college, Pullman, to Isaacson Iron Works, Seattle; C. C. Moore & Co., general contractor.

100 tons, radio tower for Western Broadcast Co., Van Nuys, Calif., to Pacific Coast Steel Corp., Los Angeles.

100 tons, or more, additions and nurses' home, District of Columbia, children's sanatorium, Buena Vista, Md., to Lehigh Structural Steel Co., Allentown, Pa.; North-Eastern Construction Co., Baltimore, general contractor.


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## Shape Contracts Pending

9000 tons, addition to Library of Congress, Washington; bids March 1.

1200 tons, high school Tottenville, Staten Island, N. Y., Pasty & Fuhrman Inc., New York, low.

1200 tons, armory, Minneapolis.

950 tons, bridge, Lake street, Elmira, N. Y.

860 tons, six state bridges, Illinois; bids Feb. 19.

800 tons, 40-ton gantry crane, specification 7855, Mare Island, Calif.; bids Feb. 13, to bureau of supplies and accounts, navy department, Washington.

750 tons, public school No. 149, Queens, New York; Richmond Engineering & Contracting Co., New York, low.

750 tons, public school, Jackson Heights, N. Y.

650 tons, Northside postoffice, Philadelphia; George A. Fuller Co., that city, low on general contract; approximately 85 tons, of bars also required.

650 tons, bridge, Franklinton, La.

525 tons, five state highway bridges, Georgia.

500 tons, cable supports, Boulder dam, Boulder City, Nev.

500 tons, Beach City dam near Dover, O.; bids to Zanesville, O., army engineers, Feb. 21.

400 tons, bridge, Washington avenue, Brooklyn, N. Y.; bids Feb. 15.

305 tons, interlocking steel sheet piling; bids to United States engineers, Wilmington, N. C., Feb. 12.

300 tons, blower building, easterly sewage disposal plant, Cleveland; bids Feb. 21.

300 tons, building, Mount St. Joseph college, Hartford, Conn.

250 tons, stadium, San Antonio, Tex.

250 tons, Mahoning county bridge, Struthers, O.; Lackawanna Steel Construction Corp., Buffalo, low on Feb. 4 bids.

230 tons, Ebey Slough state span, Everett, Wash.; bids Feb. 19.

225 tons, junior high school, Andover, Mass.; bids in.

225 tons, bridge, Elkhart, Kans.

210 tons, highway bridge, Kooskia, Idaho, for United States bureau of public roads.

200 tons, Ohio state bridges; bids to highway commission, Columbus, Feb. 15 and 16.

150 tons, miscellaneous steel, inland waterway, Core Creek, Beaufort, N. C.; bids to United States engineer, Wilmington, N. C., Feb. 28.

150 tons, bridge for United States engineers, Daufort, N. C.

120 tons, Pennsylvania railroad bulkhead, Cleveland; bids in.

Unstated, Columbia slough state bridge, Oregon; Joplin & Eldon, Portland, Oreg., low.

# Reinforcing

Reinforcing Bar Prices, Page 61

**Cleveland**—On 1200 tons of reinforcing bars for dam project No. 6 in the Muskingum, Ohio, conservancy district, on which bids were opened by the United States engineer, Zanesville, O., last week, one Ohio seller bid $2 a ton under the market, and an Alabama interest bid 20 cents under the market. There were also a few deviations in bids for bending material. These were the only variations from uniform bids submitted by 34 producers and dealers. The low bidder is understood to have explained its reduction was due to a clerical error. Uniform bids again were received on approximately 1100 tons for five smaller dams. The first bids on these were rejected two weeks ago. Other requirements are limited to small lots for municipal and state projects.

**Pittsburgh** — A decline is noted in the volume of small reinforcing bar specifications. The new billet bar market holds at 2.05c, Pittsburgh, for carload lots, and 1.90c for rail steel bars.

**Chicago** — Prospective business in concrete bars continues to accumulate, but awards are light. About 1000 tons are pending for Illinois road work, general contracts for this material having been placed. Milwaukee is expected to take bids early in March on its proposed filter plant involving about 6000 tons.

**Boston**—Contractors with projects requiring a fair volume of reinforcing steel are slow to close, and awards are light. Several hundred tons for veterans' hospital buildings, Tougas, Me., will be placed by a Brooklyn, N. Y., subcontractor who has the concrete work.

**New York** — While approximately 2100 tons are active in this district, awards have dropped since the recent buying for New Jersey highway requirements. Included in pending volume is 1000 tons for west-side, Manhattan, track depression and elevated highway projects. Bids close this week on 750 tons for Tri-boro bridge piers. New inquiry is light.

**Philadelphia** — Bids have been opened on 230 tons of bars for government barracks at Carlisle, Pa. This tonnage along with 650 tons of bars for the local aircraft factory, on which award is expected immediately, and 350 tons for the Lafayette bridge at Norfolk, Va., are the leading pending items here. Billet steel bars, cut lengths, are 2.05c, Pittsburgh, or 2.34c, Philadelphia.

**San Francisco**—Sales and inquiries have fallen off, and awards in the week aggregated less than 800 tons. No award has yet been made on 3580 tons for the Moffatt

## Concrete Awards Compared

| | Tons |
|---|---|
| Week ended Feb. 9 | 867 |
| Week ended Feb. 2 | 1,562 |
| Week ended Jan. 26 | 7,940 |
| This week in 1934 | 2,684 |
| Weekly average, 1934 | 4,084 |
| Weekly average, 1935 | 3,343 |
| Weekly average, January | 3,898 |
| Total to date, 1934 | 24,360 |
| Total to date, 1935 | 20,356 |

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tunnel, Colorado. Bids will be opened this week on over 7000 tons for the metropolitan water district, Los Angeles.

**Seattle** — Immediate requirements are not heavy, but new projects are developing. Several small tonnages, mainly for state highway work are pending. The state has called bids Feb. 19 for the Ebey slough bridge, near Everett, Wash., requiring 359 tons. Sound Construction & Engineering Co., Seattle, has the general contract at $286,240 for completing this city's light building, 200 tons being required for this project.

## Reinforcing Steel Awards

400 tons, Page avenue viaduct, St. Louis, to Kalman Steel Corp., Bethlehem, Pa.
165 tons, Visitation Valley school, San Francisco, to W. C. Hauck & Co., San Francisco.
102 tons, state bridge, Flathead county, Montana, to unnamed interest.
100 tons, state crossing, Sheridan county, Wyoming, to unnamed interest.
100 tons, buildings, Mount Vernon, O., for Pittsburgh Plate Glass Co., to Levinson Steel Co., Pittsburgh.

## Reinforcing Steel Pending

2400 tons, dams in Muskingum, Ohio, conservancy district; Truscon Steel Co., Youngstown, O., low on 1200 tons for project No. 6.
675 tons, two rolled-fill type dams; one, the Beach City dam near Dover, O., requiring 600 tons; a second, the Senecaville dam near Cambridge, O., requiring 75 tons; bids on both Feb. 21 to United States engineers, Zanesville, O.
650 tons, naval aircraft factory, Philadelphia; general contract awarded to Irwin & Leighton, Philadelphia.
570 tons, building, Fleischmann Malting Co., Chicago.
350 tons, Lafayette bridge, Norfolk, Va., early award expected by T. A. Loving, Goldboro, N. C., general contractor; approximately 1300 tons of shapes for same project previously reported to American Bridge Co., Pittsburgh.
350 tons, Ebey slough state bridge, Everett, Wash.; bids Feb. 19.
330 tons, blower building, easterly sewage disposal plant, Cleveland; bids Feb. 21.
300 tons, also 300 tons of mesh, road work, Indiana.
230 tons, government barracks, Carlisle, Pa.; general contractors' bids opened.
120 tons, Ohio state bridges; bids to highway commission, Columbus, Feb. 15 and 16.
105 tons, state highway projects, West Virginia; bids Feb. 12.
100 tons, building, Wander Co., Villa Park, Ill.
85 tons, Northside postoffice, Philadelphia; George A. Fuller Co., that city, low on general contract.
Unstated tonnage, Wisconsin road work; bids Feb. 15.

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# Pipe

Pipe Prices, Page 61

**Pittsburgh**—Pipe producers understand that preliminary discussions have been conducted between Texas state officials and Secretary of the Interior Ickes relative to construction of a natural gas pipe line from the Texas Panhandle to St. Louis and Detroit. Observers estimate the proposal would cost about $50,000,000 and involve nearly 200,000 tons of 24-inch pipe. However, no formal application for PWA funds has been made. Boiler tubes, seamless mechanical tubing and standard pipe all appear to be in slightly better demand, but oil country goods show some hesitation on the part of certain southwestern buyers. All pipe discounts are unchanged with no prospects for early revision.

**Cleveland**—Demand is restricted to jobber's requirements for steel pipe, which shows some slight improvement, and to a few municipal projects requiring cast pipe. Columbus, O., will take bids Feb. 18 on 420 tons of cast for a watermain.

**Chicago**—Cast pipe orders are slightly more numerous. Largest purchases involve only a few hundred tons, but buying of one and two carloads is more active. Producers have fair backlogs, shipment of which is deferred in some instances by adverse weather. With the approach of the active season for pipe laying a marked improvement in demand is anticipated. Chicago is inquiring for 32,500 feet of 2 and 2½-inch standard steel pipe.

**Boston**—While projects requiring cast pipe for spring work are fairly numerous, little definite inquiry for material has developed and buying is light. Merchant steel pipe buying is steady, but not in heavy volume. Another light year for utility company buying is forecast.

**New York**—With the closing of general contract bids this week for New York city requirements and a direct award at Yonkers, N. Y., several thousand tons of cast pipe are active. Atlas Contracting Co. is low on a water extension line, Bronx, New York, taking several hundred tons of steel and cast iron pipe.

**Seattle**—The market is more active. Municipal requirements are heavy but are still retarded by lack of funds. Raymond, Wash. will ask bids soon for an unstated tonnage of 6 to 12-inch cast iron or wood pipe.

**San Francisco**—Cast pipe awards were the highest for any week so far this year and totaled 1576 tons. Movement, generally, is improving.

Among new inquiries are 324 tons for Belmont, Calif., and 133 tons for Santa Barbara, Calif. Demand for oil country goods has increased and the outlook for the first six months of the year is encouraging.

## Cast Pipe Placed

750 tons, 6-inch, class 250, Los Angeles, allocated as follows: 428 tons to United States Pipe & Foundry Co., Burlington, N. J., and 322 tons to National Cast Iron Pipe Co., Birmingham, Ala.

601 tons, 6 to 12-inch, class 150, Pasadena, Calif., to United States Pipe & Foundry Co., Burlington, N. J.

300 tons, 12-inch and under, Rye and Mamaroneck, N. Y., to Donaldson Iron Works, Emaus, Pa.

225 tons, 16-inch, Los Angeles, divided between National Cast Iron Pipe Co., Birmingham, Ala., and Florence Pipe Foundry & Machine Co., Philadelphia.

150 tons, Deland, Ill., to James B. Clow & Sons, Chicago.

130 tons, Duluth, Minn., to James B. Clow & Sons, Chicago.

115 tons, 6 to 12-inch, Redmond, Oreg., to United States Pipe & Foundry Co., Burlington, N. J.

100 tons, 8 and 10-inch, Mount Vernon, N. Y., to Donaldson Iron Works, Emaus, Pa.

## Steel Pipe Placed

Unstated tonnage, 23,000 feet, 1-inch cold-finished chrome-nickel seamless tubing, 14 to 16-foot lengths, Rock Island, Ill., arsenal, to Ohio Seamless Tube Co., Shelby, O.

## Cast Pipe Pending

420 tons, 12 and 16-inch, watermain extension, Columbus, O.; bids Feb. 18.

367 tons, 10 and 12-inch, Redwood City, Calif.; bids in.

324 tons, 4 to 8-inch, class 150, Belmont, Calif.; bids Feb. 12.

265 tons, 6-inch, Sauquoit, N. Y.; bids Feb. 12.

133 tons, 4 to 12-inch, class 150, Santa Barbara, Calif.; bids in.

150 tons, 4, 6 and 8-inch, Richwood, O.; bids Feb. 15.

150 tons, Oshkosh, Wis.; United States Pipe & Foundry Co., Burlington, N. J., low.

125 tons, sewer, Aurora, Ill.

Unstated tonnage, 6 and 8-inch pipe for $60,000 waterworks plant, Adams, Wis.; James B. Clow & Sons, Chicago, low.

Unstated tonnage, 6 to 12-inch, Raymond, Wash.; bids soon, alternates on wood.

Unstated tonnage, 3460 feet, various sizes, La Center, Wash.; bond vote Feb. 13.

Unstated tonnage, 16-inch, Chehalis, Wash.; bids Feb. 13.

## Steel Pipe Pending

1300 tons, 48-inch, Pelham parkway, Long Island, New York; general contract to Oakhill Contracting Co., Long Island, N. Y.

500 tons, principally 48-inch, city project in Bronx, New York; general contract to Atlas Construction Co., New York.

Unstated tonnage, proposed gas line from Texas Panhandle to St. Louis and Detroit; PWA loan of $50,000,000 may be asked. Line probably would take 150,000 to 200,000 tons.

Unstated tonnage, 20,000 feet of 2-inch; 12,500 feet of 2½-inch standard steel pipe, and 1500 four-inch steel pipe extensions for city of Chicago; bids to commissioner of public works, Feb. 19.

Unstated tonnage, 1200 feet, 12-inch, shore pipe, United States engineer, Jacksonville, Fla.; bids Feb. 12.

Unstated tonnage, 10,200 linear feet, 2½-inch, butt welded, quartermaster depot, Chicago, schedule 179; bids Feb. 27.

## Tin Plate

**Tin Plate Prices, Page 60**

**Pittsburgh**—Despite the fact tin plate mill operations are at a strong 85 per cent, the industry still is able to add to its backlogs. Mills have considerable tonnage on books which may be shipped at their convenience. Canmakers' specifications have been heavy, and comparable with any period in recent years. Prices on tin


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mill products are steady, with standard coke tin plate, $5.25 per base box, and No. 24 unassorted long ternes, 3.40c, Pittsburgh.

**New York**—Tin plate specifications continue heavy. Eastern producers are operating virtually at capacity.

## Bolts, Nuts, Rivets

**Bolt, Nut, Rivet Prices, Page 61**

Lack of railroad car repairing still affects the bolt, nut and rivet market at Pittsburgh, where producers have not shared greatly in automobile business. Bolts and nuts are generally available at 70-10-10 off list with large rivets quoted 2.90c, Pittsburgh and Cleveland, 3.00c, Chicago, and small rivets, 70-5 off.

Producers at Cleveland hope to hold present prices for second quarter, the market having firmed up after a prolonged period of weakness. Automobile demand continues strong, and implement manufacturers are increasing specifications, while railroad requirements are at the lowest point in some months.

Following fairly good demand in January, bolt and nut buying at Philadelphia has tapered somewhat.

## Semifinished

**Semfinished Prices, Page 61**

A maker of open-hearth rerolling and forging iron billets has reduced the market, on a Cleveland base only, $1.90 a ton, effective Feb. 14. At that time, rerolling billets in this quality will be $34 per ton, and forging quality billets, $39. This change has not affected wrought iron billets which hold at $55, Pittsburgh, for rerolling quality, and $90, Pittsburgh, for forging quality, plus size extras on the latter ranging from 90 cents to $1.90. Sheet bars are moving in the best volume for February in several years. Many users of steel billets have fairly heavy stocks carried over from 1934. The market on rerollers is firm at $27, base Pittsburgh, with forging quality billets, $32, Pittsburgh. Sheet bars are $28, Pittsburgh, and wire rods, $38.

# Pig Iron

**Pig Iron Prices, Page 62**

**Cleveland**—Diminishing sales and increasing shipments still feature the pig iron market. Producers say it is not unusual for new orders to fall off as the quarter advances, while shipments are being raised by heavier specifications on contracts. So far this month the movement of iron to foundries, mainly automotive, is about 10 per cent over the comparable period last month, and January was notable for an increase of approximately 75 per cent over December. Since the code was adopted a little more than half the iron has been sold on quarterly contracts, the remainder representing new orders. Books will be opened shortly for the second quarter, and furnace interests generally do not expect prices will be changed.

**Pittsburgh** — Small tonnages of malleable, bessemer and other foundry pig iron grades continue to be purchased by consumers in western Pennsylvania and eastern Ohio districts from Pittsburgh blast furnace operators. The poor merchant furnace situation, however, has not changed and continues to find scrap taking up a large part of current foundry melt and integrated steelworks actively soliciting former merchant iron business. Pittsburgh furnace base prices name foundry grades, $18.50 per ton; basic, $18.00; and bessemer, $19.

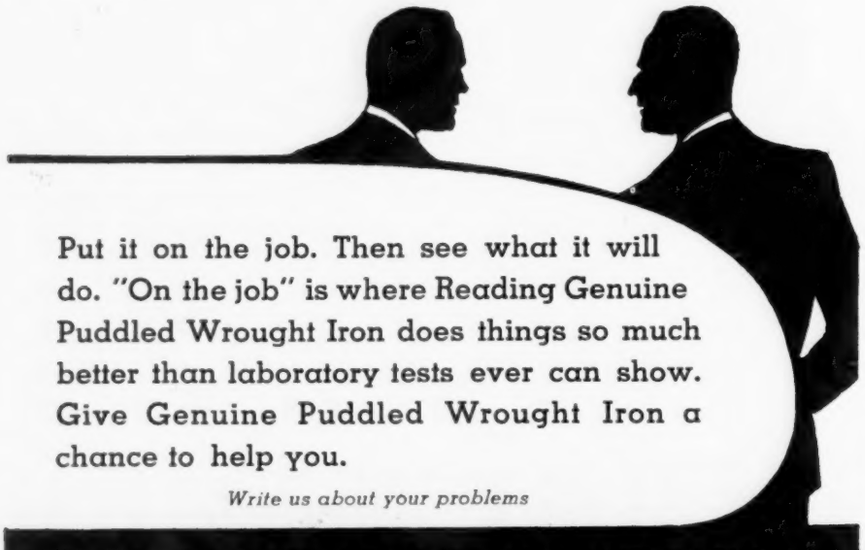
**Chicago**—Pig iron shipments continue to show improvement over the corresponding period of all preceding months since June, and the February movement definitely will mark the highpoint for eight months. A large share of present activity among small foundries as well as large plants may be traced to automotive needs, while farm implement manufacturers still hold to active schedules. Some betterment is noted in demand for railroad castings, these being principally for repair parts. Quietness in construction of new railroad equipment is restricting operations of some foundries. Mill roll and ingot mold producers have experienced a material increase in their operations the past 30 to 60 days.

**Boston** — Slight improvement in car lot buying of pig iron has not materially increased total shipments following the purchase of 600 tons of low-phosphorus iron by a Worcester, Mass., heavy machinery builder. No large inquiries are out and small-lot purchasing is expected to continue. No pig iron imports were received in the Boston customs district during January.

**New York**—Pig iron buying here is unchanged from a week ago, with volume still restricted. General belief now is that there will be no revision in prices for the next quarter.

**Buffalo**—Pig iron is more active, with shipments improving steadily and with some additional purchases expected this quarter from consumers thought to be covered for the period. An additional merchant furnace is being made ready for operation here probably late this quarter.

**Philadelphia**—While the Reading Iron Co., Reading, Pa., has closed on at least 2000 tons of pig iron since the first of the month, buyers generally are taking small lots for immediate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needs. Indications point to a further slight improvement in daily shipments this month, although the outlook still fails to measure up to earlier expectations. One leading producer reports January shipments about 10 per cent over December.

**Cincinnati** — Shipments of pig iron are heavier, and new buying is more liberal, with anticipatory orders up to 500 tons, chiefly northern iron. The gain in the melt is broader, but without much improvement in agricultural implements. Stove foundries are resuming at an unusually good rate in this season.

**St. Louis**—Demand for pig iron continues active, with shipments thus far in February exceeding those for the corresponding period last month. The January movement was the largest for the month since 1928. Recent sales include a considerable tonnage of basic iron.

**Birmingham, Ala.** — Ten blast furnaces are to be in operation by the end of the month in this district, basic iron to be produced at five and foundry iron at the others. Production of iron went above 70,000 tons in January and will be near 100,000 tons for February, despite a short month. The Nashville, Tenn., furnace of Tennessee Products Corp. will be blown in shortly.

**Seattle** — Demand continues slow, although foundry activity is better with spring marine work developing. Specialty plants, notably those manufacturing diesel engine units, are busy but demand for logging machinery continues slow. Pig iron prices this quarter are unchanged.

**Toronto, Ont.** — Business shows further improvement and there are prospects for a better demand later. Foundry interests gradually are stepping up operations and the daily melt is averaging close to 40 per cent.

# Scrap

**Scrap Prices, Page 63**

**Pittsburgh**—A district mill bought a small lot of No. 1 heavy melting steel here last week at $13 per ton, delivered, and the Baltimore & Ohio's 1200 tons of No. 1 heavy melting steel was sold Feb. 4 for around $13.85 for both Pittsburgh delivery and Johnstown, Pa., shipment. The Baltimore & Ohio disposed of its railroad specialties at $14.40 per ton, Pittsburgh district. In spite of the fact that most consumers here and in the Wheeling district are out of the market, the situation is tight, in that scrap brokers are not able to buy heavy melting steel for much less than $12.75 from dealers.

**Cleveland**—Trading in steel and iron scrap here is quiet but shipments are heavy. Railroad malleable is up $1, borings, breakable cast and No. 2 busheling are up 50 cents. Heavy receipts in the Valley have caused embargoes by the Youngstown Sheet & Tube Co. at Youngstown, O., and Republic Steel Corp. at Warren, O.

**Chicago**—Scrap is inactive both as to mill purchases and dealer buying. There is a disposition on the part of consumers to postpone extensive buying. Railroad offerings recently have been light though sufficient scrap is available to accommodate consumers. The top price of No. 1 heavy melting steel continues $12.75.

**New York** — Export prices for heavy melting steel have been bettered by an eastern Pennsylvania steelworks, taking material from this district, both for rail and barge shipment to its seaboard works at $1 to $2 more than dealers have paid for barge loading. This, combined with difficulty in moving scrap to barge, has a strong influence on melting steel grades. Demand for boat loading continues unabated, but scrap is coming out less freely. Cast and other grades are not active.

**Boston**—Except for heavy melting steel, domestic demand for scrap is light, while outside rail shipments are limited to scattered lots of turnings and blast furnace borings. For the former dealers pay $3 to $3.25 f.o.b. for Pittsburgh. Dealers' prices for export are unchanged. Cast scrap, notably No. 2, is being bought for boat loading, dealers paying $7.50 to $7.75, dock.

**Philadelphia**—Scrap prices are unchanged and basically strong. The Pencoyd, Pa., consumer of No. 2 steel entered the market recently after an absence of several weeks, first offering $9.50 and later $10, without developing much tonnage. The principal buyers of No. 1 steel continue out of the market, with this grade holding nominally at $11.50 to $12, delivered, consuming plant, the outside figure most representative. Shipments on some grades have been held up for Conshohocken, Pa., and Harrisburg, Pa.

**Buffalo** — Dealers are making large shipments on orders for scrap but have taken no new business dur-


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ing the past week. The range on No. 1 heavy melting steel is from $12, bid, to $13 asked by dealers. Other prices are nominal.

**Cincinnati** — Quotations on iron and steel scrap are nominally unchanged and softer, in the wake of recent mill purchases. Consumer buying during the past week was restricted to miscellaneous lots.

**St. Louis**—In absence of quantity purchasing the market for iron and steel scrap has developed a slightly easier trend, with several specific price reductions.

**Birmingham, Ala.**—The iron and steel scrap market is showing slight improvement though no heavy movement is noted.

**Seattle**—Despite weakness of exchange, No. 1 steel scrap is strong at $9.25 and it is reported that some business has been done at a higher level. Japanese buyers are active. Exporting houses maintain firm quotations. Supplies are not plentiful at tidewater and are expected to be replenished from the interior as soon as weather permits. Going prices are expected to attract material for shipping offshore. Heavy consignments are being forwarded from Portland, Seattle and Vancouver, B. C., mainly old business, but new orders are being placed. Local demand is slow as the mills are not buying and foundries are taking only occasional car lots.

**Toronto, Ont.**—Trading in iron and steel scrap has swung largely to the latter grades. Shipments of heavy melting steel are being made to the mills in the Hamilton district and Montreal dealers find improved demand. Turnings are slow. Foundries are maintaining a fair demand for iron grades.

## Warehouse

**Warehouse Prices, Page 64**

**Pittsburgh** — Following complete adoption of the new resale market on nails, jobbers quote $2.80 per keg locally and $2.75 per keg for districts not mill basing points. Other jobbing steel prices are unchanged. Demand is increasing.

**Cleveland**—Prices are firm and a fair volume of business is being booked. Blue annealed sheets are more active. Other orders appear more evenly distributed.

**New York**—Warehouse buying is well diversified with small orders predominating. Prices are generally firm.

**Philadelphia** — Warehouse business has been at about the rate prevailing the latter half of January. Sellers look for little real improvement before the end of this month. Prices are steady.

**Cincinnati**—Demand from warehouses here continues at the improved levels attained in January. Individual orders are small. Prices remain unchanged.

**St. Louis**—Iron and steel warehouses report further steady expansion in sales. Materials for use in the rural districts, notably wire fencing and accessories, are moving more actively than a year and two years ago.

**Seattle**—Jobbing houses report January volume larger than in the month last year. Buying continues in fair volume but in small tonnages.

## Metallurgical Coke

**Coke Prices, Page 61**

Connellsville, Pa., beehive coke producers continue to quote $3.85, spot, on furnace coke with the allowable $3.60 market for contracts. On the same basis, spot foundry coke is available at $4.60, and premium foundry coke at around $5.10. By-product foundry coke, however, is moving better than beehive grades, and the metallurgical coke market is dwarfed by heavy domestic shipments. At Chicago deliveries are well maintained at the high point of January. Automotive and farm implement activity is helping foundries most. Prices for February are unchanged from January. Increased production by stove foundries has brought heavier demand for foundry coke in the Cincinnati district. Producers at Birmingham, Ala., are increasing production to meet demands.

## Ferroalloys

**Ferroalloy Prices, Page 62**

Ferromanganese shipments are leveling off, although volume continues substantial. The market is unchanged at $85, duty paid, Atlantic and gulf ports. In view of continued strength in manganese ore, some trade interests look for an advance in ferromanganese for second quarter. Domestic spiegeleisen, 19 to 21 per cent, is unchanged at $26, furnace, on quantities up to 50 tons, and $24 on 50 tons and over. E. J. Lavino & Co., Philadelphia, have lighted a furnace at Reusens, Va., for production of ferromanganese. An important integrated steelworks in the Pittsburgh district is considering blowing in one of its idle blast furnaces for ferromanganese.

## Coke By-Products

**Coke By-Product Prices, Page 61**

**New York**—Naphthalene has been reduced to 5.00c a pound in barrel lots, with 5.25c a pound applying to shipments of 50 pounds and less. Releases against contracts are slightly

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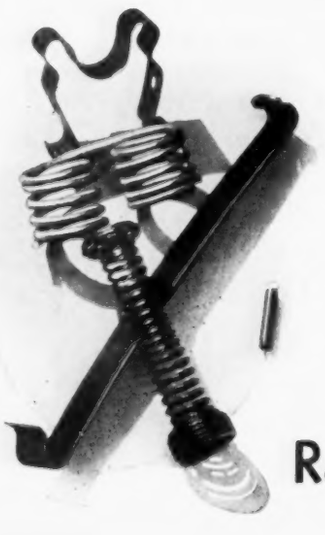

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heavier. Phenol buying has improved materially, due to larger industrial demand. Toluol and xylol are active. Sulphate of ammonia shipments are steady.

## Steel in Europe

**Foreign Steel Prices, Page 64**

**London** — (*By Cable*) — Pig iron buying in Great Britain is slow but heavy consumption promises renewed activity. January exports of pig iron were 7581 tons, the highest for any month since November, 1931. The export outlook for pig iron is improving. Steel demand is strong, including exports, especially to Russia. Domestic trade in semifinished steel is good and imports have almost ceased. Tin plate and galvanized sheets are quiet.

The Continent's export trade is dull. Brussels reports Germany is capturing markets by barter. French domestic trade shows improvement.

## Nonferrous Metals

**Nonferrous Metal Prices, Page 62, 63**

**New York**—Demand for nonferrous metals last week was generally lighter but sales were sufficient to maintain prices at a steady level. Lead was outstanding with fairly active buying done by consumers following lower prices quoted by producers in the previous week.

**Copper**—Sales in the domestic market declined from the active pace set during the first three trading days of the month but the price tone continued firm on the basis of 9.00c, Connecticut, for electrolytic. The foreign market was upset by liquidation selling caused by the failure of the firm of James & Shakespeare. Soundness of the copper position was reflected in the fact that the price did not drop more violently. Export copper was quoted during the week as low as 6.62½c, c.i.f. European ports.

**Zinc**—Slab zinc stocks were reported 76 tons greater at 119,906 as of Dec. 31 but it was understood that high grade stocks alone were cut by a fair sized tonnage during the month. The prime western market was quiet last week with prices unchanged on the basis of 3.70c, East St. Louis.

**Lead**—Leading sellers were able to equal their intakes but were not free sellers at the quoted prices of 3.50c, New York, and 3.35c, East St. Louis.

**Tin**—Straits tin market lagged so far as new business was concerned. Prices held fairly steady in the range of 51.00c and 51.20c for spot. It is believed that the tight situation in spot supplies will continue until March.

**Antimony**—Only light small-lot buying was noted, all on the basis of 14.50c, duty paid, for Chinese spot.

**Aluminum**—Demand was slower but prices held on basis of 19.00c to 20.00c for 99 per cent plus.

## Equipment

**Pittsburgh**—Bethlehem Steel Co. the past week has been actively soliciting bids on work in connection with the new continuous 76-inch sheet mill for its Lackawanna, N. Y., works. It is reported that around Feb. 15 final suppliers' prices on this project will have been entered and contracts awarded. Equipment inquiry from foreign countries is promising and includes some recent requests for prices from several steel producers in Australia. Rotary Electric Steel Co., Detroit, has placed several mill electrification contracts with Westinghouse in connection with changes involving a new blooming mill and cold strip mill. Carnegie Steel Co., has awarded a large part of the electrical equipment to be installed at its McDonald works.

Bethlehem Steel Co. has announced plans to improve its Cambria works, Johnstown, Pa., with a $500,000 expenditure. Existing wire and rod mills will be equipped to manufacture springs and allied products formerly made at Sparrows Point, Md., and an additional heat treating process will be installed in the wire mill.

Recent order for 37 Becker-type coke ovens which Koppers Construction Co. here received from Public Service Corp. of New Jersey, for the latter's Camden, N. J., plant, is the first order for additional coking capacity placed since 1930. General Smelting Co., New York, is reported considering additional by-product coke ovens of the Wilputte type for its Mexican properties.

Inquiry also is reported for the construction of a blast furnace at Mexico City for a leading Mexican steelworks.

**Boston**—Additional government contracts for machinery, largely for arsenals have been awarded New England builders and dealers, awards going to Austin-Hastings Co., Henry & Wright Mfg. Co., Jones & Lamson Co., Pratt & Whitney Co. and Greenfield Tap & Die Co. General industrial inquiry has improved, but buying is restricted. Several export inquiries for grinding machinery for Europe, with some foreign buying, have been figured. Ball bearing makers have stepped up operations Reed-Prentice Corp., Worcester, Mass., reports orders in the past few weeks from the navy department for engine lathes totaling $95,000.

**Denver**—Bids close Feb. 20 with the bureau of reclamation, Denver, on one turbine gallery crane with two hydraulic jacking frames of 150 and 60 tons capacity, respectively;

also on two 30-ton trolleys and two lifting beams. Equipment is for the Boulder dam power plant.

**New York**—Inquiry for machine tools has improved, although no large lists are pending. A New York district electrical equipment firm, however, is in the market for five units. Sheet metal working machinery is again active in inquiry.

**Chicago**—Machinery and equipment inquiries continue in fairly heavy volume, but orders have slackened moderately in some instances. Uncertainty attached to the coming gold clause announcement is given by some prospective buyers as the reason for deferring placing of orders at this time. The largest machine tool inquiry pending is for about 30 tools for the Tennessee valley authority to be delivered to Corinth, Miss. The list includes lathes, grinders, punches and miscellaneous metalworking equipment. Orders for small tools show occasional gains. Foundry equipment continues fairly active and outlook for the balance of the year is regarded favorably.

**St. Paul**—American Hoist & Derrick Co. has been awarded seven gasoline operated locomotive cranes for Mississippi river dams, army engineer projects.

**Seattle** — The general contractor at Grand Coulee dam plans to construct eight silos with capacity of 5000 barrels of cement each; unloading, blending and delivery equipment also will be installed.

# Construction and Enterprise

## New York

BUFFALO—Buffalo naval militia unit has applied to PWA for an appropriation of $350,000 for a new armory.

BUFFALO—City is having plans drawn for a $500,000 water tank construction program to improve pressure on its lines.

NEW YORK—Kraft-Phenix Cheese Corp., 120 Broadway, James L. Kraft president, has announced a $1,000,000 building program effective in Freeport, Ill., Plymouth, Wis., Atlanta, Ga., and Montreal, Que.

NEW YORK—Secretary of the Interior Harold L. Ickes, PWA administrator, has declared that the government would allot $3,780,000 to the city of New York for construction of an electric light and power plant.

## New Jersey

CAMDEN, N. J.—Public Service Electric & Gas Co. has awarded contract to Koppers Construction Co., Pittsburgh, for an addition to its gas plant. The contract provides for the construction of 37 by-product coke ovens of the Becker type having a daily capacity of 600 tons of coal and producing in addition to gas, coke, tar, ammonium sulphate and other products.

MAPLEWOOD, N. J.—Utility Blade Co. has leased a building at 17 Newark way, where it will manufacture scissors and cutlery products.

## Pennsylvania

MERCER, PA.—Sharon Coal & Limestone Co., subsidiary of United States Steel Corp., has closed its No. 2 mine here to electrify the equipment on the 65-foot shaft, including installation of an electric hoist.

PHILADELPHIA—Frankford Arsenal will take bids Feb. 15, contract 35-249, on a vertical milling machine.

PITTSBURGH—Zigler Inc. has been organized to manufacture machinery and equipment for contractors and railroads, by F. X. McCulloch, Park building, H. Fitzpatrick and R. M. Beck.

PITTSBURGH—Joseph P. Miller & Associates Inc. has been incorporated by J. P. Miller, M. A. Rubin, 5546 Jackson avenue, and E. L. Miller, to manufacture and deal in automobile equipment.

PITTSBURGH — Certified Spumoni Corp. has been formed to manufacture machinery and equipment for production of ice cream, ices and allied products, by Robert McCaw, 224 Langley avenue, Merle Woman and Candida Sportolari.

## Ohio

CLEVELAND—Standard Battery Mfg. Corp. has been incorporated by Louis O. Miller, 335 Leader building, F. H. Schwartz and Carol E. Stone.

CLEVELAND—J. F. Kramer Foundry Co., 6222 Walworth avenue, has been organized by John Tackacs, John Yako, Joe Kramer and Samuel Racz, to operate a gray iron foundry.

TOLEDO, O.—Automotive Parts Corp., H. F. Hadley president, has leased a building on Spielbusch avenue to enlarge its facilities.

## Michigan

BATTLE CREEK, MICH.—Thomas H. Thorne, city clerk, will receive bids until Feb. 26 for construction of a sewage treatment works, consisting of a main building and pumping station, screen building, settling tanks, digestion tanks and other appurtenances. Estimated cost $275,000.

BUCHANAN, MICH.—Larson Products Corp. has been formed to engage in the stamping of metals, by Daniel S. Larson, Buchanan, Mich.

DETROIT—Eaton Mfg. Co., French road, has awarded contract to W. J. C. Kaufmann Co. for an addition to its warehouse.

DETROIT—Koppitz-Melchers Brewing Co. is planning to erect a brewery at the foot of DuBois street on the river front.

DETROIT — Cooper-Little Co., 844 Maccabees building, has been awarded contract for a factory addition and alterations to the Ypsilanti plant of the Ford Motor Co.

DETROIT—Zens & Nelson Inc., 3640 Woodhall street, has been awarded contract for a boiler house to be erected on Scotten avenue for the Parker-Wolverine Co.

DETROIT—Reliance Steel Corp., 1205 Beaufait avenue, has been incorporated to deal in steel, steel products and metals, by Arthur L. Tushbant, 1644 Virginia Park.

DETROIT—Stephen J. Stachowiak, 11334 McDougall avenue, has completed plans for the construction of a brew house for the C. & K. Brewing Co., Hamtramck, Mich.

DETROIT—Arthur O. Misch, 3245 Helen avenue, has been awarded contract for remodeling and altering a building on Bellevue avenue into a brewery for the Regal Brewing Co.

DETROIT — Parker-Wolverine Co., 2177 Milwaukee avenue, Charles H. Awkerman president, has acquired the Stone Enameling Co. to increase its capacity by 50 per cent, and additional machinery and equipment will be installed.

DETROIT—Detroit Steel Corp., South Oakwood avenue, has an expansion and improvement program under way which will increase its capacity for the manufacture of cold-rolled strip approximately 40 per cent. The program will involve an expenditure of about $125,000 for new machinery, equipment and alterations. The annealing furnace division will be expanded, a new four-high,reversible mill will be installed, and other production machinery added.

ESCANABA, MICH.—Diamond Pole & Piling Co., James R. Andrews manager, will resume operations at its mill as soon as machinery and equipment have been put in readiness. The mill will employ about 55 men.

HANCOCK, MICH.—Joseph Rock, Angelo Villanelli, Julio Manasche, N. Ricconini and Angelo Vignetto have purchased the controlling interest in the Hancock Park Brewery from W. O. Baysinger. The brewery will be entirely reconditioned with new equipment and will have an initial capacity of 35,000 barrels a year.

JACKSON, MICH.—Reynolds Spring Co. has leased the plant of the Lockwood Motor Co., and is remodeling it for occupancy.

JACKSON, MICH.—Ryerson & Haines Inc. has taken over an adjoining plant and will add 500 men to the force, to take care of its expansion in accessory manufacturing.

JACKSON, MICH.—Turnmilling Corp. has been organized to deal in and with metal working machinery and tools, by G. W. Blackinton, 1801 Union & Peoples National building.

OTSEGO, MICH.—The old Bardeen mill, idle for several years, has been purchased by the Prairie State Paper Mills, Joliet, Ill., and is being remodeled for operation.

MT. CLEMENS, MICH.—E. L. Pettengill, city engineer, has filed application with PWA for a grant of 30 per cent on a $410,000 sewage disposal system and a loan of the balance of that amount.

MT. PLEASANT, MICH.—H. Beatty, engineer, is taking figures on materials and equipment for construction of a $40,000 oil refinery and cracking plant to be erected at Bay City, Mich.

MUSKEGON, MICH.—City of Muskegon is contemplating construction of a municipal power and light plant.

LANSING, MICH.—Olds Motor Works will erect a $180,000 factory addition adjoining its present plant.

WYANDOTTE, MICH. — Standard Gray Iron Foundry Inc., 850 Grove avenue, has been incorporated to deal in

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### Illinois

CHICAGO—Armour & Co., 316 South LaSalle street, is taking bids for construction of a $1,000,000 beef house. The site of the new building is near the Union stock yards.

### Alabama

OAKMAN, ALA.—Town will receive bids within four months on $32,000 waterworks improvements, including pumping plant, deep well and pump tank. Totten & Loving, engineers, Guin, Ala.

### District of Columbia

WASHINGTON—Chief, bureau of yards and docks, navy department, will take bids Feb. 27, specification 7857, for two 20-ton locomotive cranes for the navy yard.

WASHINGTON—Bureau of supplies and accounts, navy department, will open bids Feb. 15, schedule 4208, on refrigerating pumps and compressors; and Feb. 19, schedule 4252, on one motor-driven universal milling machine, delivery Philadelphia.

### Kentucky

COVINGTON, KY.—City, Theodore Kluemper city manager, is considering erecting a $75,000 filtration plant.

LOUISVILLE, KY.—Glencoe Distillery Co., 715 South Twenty-sixth street, plans erecting distillery on Cane Run road, to cost about $100,000.

SEBREE, KY.—City will take bids Feb. 15 for $53,000 waterworks project. Finch & Babcock, Indianapolis, consulting engineers.

### Louisiana

MANSFIELD, LA.—W. C. Nabors is planning to construct an addition to plant for manufacture of cane trailers and vans for hauling of freight.

### Maryland

EDGEWOOD ARSENAL, MD.—Chemical Warfare Service will take bids Feb. 14, proposal 35-88, for two 200-gallon, two 1000-gallon and one 2000-gallon vertical cylindrical tanks.

### Mississippi

RIPLEY, MISS.—Town will vote Feb. 19 on $52,000 bonds for constructing a waterworks system.

### North Carolina

CHARLOTTE, N. C.—Harry P. Shaw, 900 Queens road, is planning to establish a furniture manufacturing plant at 216 South College street, and will operate it as the Shaw Furniture Co.

### West Virginia

CHESTER, W. VA.—Otis Mfg. Co. has plans about completed for an addition to its manufacturing plant, and will probably take bids about April 1. Cost is estimated at $30,000.

HUNTINGTON, W. VA. — United States Engineers office will receive bids Feb. 28 for installing operation building machinery at lock No. 1, Winfield, Kanawha river, including installation of air compressors, pumps, tanks.

WHEELING, W. VA.—Wheeling Machine Products Co., 1920 Main street, is taking bids for an addition to its manufacturing building on the Wheeling-Wellsburg road.

### Virginia

LURAY, VA.—Luray Ice Co., E. C. Harnsberger president, plans to rebuild its burned ice plant.

RICHMOND, VA.—E. A. Fulcher Distilling Co. has been incorporated to operate a distillery, by R. A. Elmore, Lyric building.

### Arkansas

ARKANSAS CITY, ARK.—Light and power plant owned by Arkansas Power & Light Co. recently sustained damages by fire.

### Oklahoma

OKLAHOMA CITY, OKLA.—Stanley Machinery Co. has been incorporated with $25,000 capital, by Fred M. Stanley, Oklahoma City, Okla., and Clayton Carder, Hobart, Okla.

### Texas

DALLAS, TEX.—Blessing & Fuller Planing Co. is planning to rebuild its burned plant at Henderson and Miller streets.

GALVESTON, TEX.—Texas Nail & Wire Mfg. Co. has been reorganized as the Texas Wire & Nail Co., with capital of $300,000, by F. P. Chandler and J. L. Somers, 4406 R street.

STEPHENVILLE, TEX.—City will vote Feb. 26 on $196,000 municipal light bonds.

WICHITA FALLS, TEX.—City will make application for PWA loan of $2,220,000 for construction of light and power plant.

### Wisconsin

MILWAUKEE—Dunck Tank Works Inc., 2422 North Thirtieth street, manufacturer of tanks for breweries, dairies, etc., is building a factory addition, 40 x 65 feet, and has also taken over some adjoining floor space for increasing output about 35 per cent.

SOUTH MILWAUKEE, WIS.—Bucyrus-Erie Co. has been awarded an order to manufacture an electrically-operated drag line excavator to be equipped with a 250-foot boom and a 12-yard bucket, and weighing about 900 tons. It is to be shipped to Brazil where it will be used for stripping from a rock quarry.

SUPERIOR, WIS.—Pittsburgh Coal Co. plans to make repairs to its coal dock at a cost of $40,000.

TWO RIVERS, WIS.—Preliminary plans are being made for an addition to the local vocational training school which contemplates an investment of $40,000 to $50,000 for building and equipment.

WAUSAU, WIS. — Wausau Iron Works has been awarded contract to manufacture 200 large, electric-welded steel tanks for delivery by March 1.

WAUSAU, WIS.—The county board has authorized the road and bridge committee to set up as an emergency relief project the building of a machinery repair and storage warehouse estimated to cost $43,000. J. A. Clark is county highway commissioner.

WISCONSIN RAPIDS, WIS.—[illegible] of education, A. B. Bever pres[illegible] plans construction of a 1-story voc[illegible] al school, to include auto-mech[illegible] room, welding equipment, forge, room, machine shop and foundry.

### Minnesota

MINNEAPOLIS—Northern Pump Co., 920 Eighteenth avenue, northeast, has started construction of a 1-story factory addition, 40 x 67 feet.

ST. LOUIS PARK, MINN.—[illegible] celled Mfg. Co., New York, has [illegible] the old Monitor Drill Co. plant Louis Park, suburb of Minneapolis, and is remodeling the factory and installing new machinery and equipment for the manufacture of railroad fuses and fireworks. Roy R. Trempy, general manager, is supervising the completion of the new plant.

### Iowa

WATERLOO, IOWA—Waterloo She[illegible] Metal Works has been incorporated engage in sale and installation of f[illegible] naces.

### Nebraska

OMAHA, NEBR. — Sterling [illegible] Products Co. has been incorporated with capital of $10,000 to conduct a general foundry, machine shop and manufacturing business, by C. L. Waldron and D. O. Mathews.

### Colorado

GREELEY, COLO.—R. W. Gelder, city engineer, is preparing plans for a sewage disposal plant to cost $50,000. If plans are approved they will be submitted to the voters in the spring election.

### Pacific Coast

COULEE CITY, WASH.—General contractors for the Coulee dam are planning eight silos, 5000 barrels cement capacity each. Specifications will include unloading equipment and blending machinery. Construction will be started soon.

RAYMOND, WASH.—Reconstruction of machine shop at Willapa Harbor Lumber Mills, recently damaged by fire, is under way. New machinery is to be installed. (Noted Jan. 14).

SEATTLE—City council is studying proposal for a 600-car municipal automobile garage and machine shop. Estimated cost is $350,000, and a federal loan will be asked if plans are approved.

TACOMA, WASH.—J. E. Berkheimer Mfg. Co. is installing asphalt refining equipment, including two large tube stills, storage and loading facilities. A similar plant is contemplated at Portland, Oreg. W. T. Chappe is manager.

### Dominion of Canada

GALT, ONT.—Maurice Cabral is establishing a plant for the manufacture of tacks and nails.

### Foreign

ROSARIO, ARGENTINA—Fire of undetermined origin damaged severely the International Harvester Co. plant here.